Data Relative to the Use of Producer Gas in Brass Melting

By M. Herr

The information contained in the accompanying article is worthy the attention and consideration of all engaged in brass foundry work, giving as it does, a clear and unbiased statement of achievement realized from practical operation.

ABOUT five years ago, after very exhaustive and costly experimenting, the double flow producer for bituminous fuel was pronounced a success, placed on the market and the first commercial plant, consisting of three 175 horse-power units, was installed.

When we were experimenting with producers, we found that a certain temperature in the fuel bed resulted in the production of more or less tar, and by noting the temperature, we were enabled to guard against a recurrence thereof. In the field we found that it was impracticable to try to teach an operator the significance of individual items of this character, so we simply show him the color of the proper fire on top and say, "Keep it looking that way." We have adopted a language that he can understand, but haven't told him anything about tar at all. We learned that gas clean enough for engine work was still objectionable for continuous operation, due to the deposit of lamp black at the elbows and turns in the piping. It became necessary, therefore, to still further purify the gas, particularly for installations where much small piping was used. Our present practice is to supply dry scrubbers with all equipment, as an auxiliary cleaning device to the static washer. This dry scrubber is installed in such a way that it can be cleaned during operation by by-passing the gas around it for a short period.

The value of the use of producer gas for fuel purposes has long been realized by steel makers, and, as we all know, gas has been used for years in the steel industry. Its progress in the industrial field for small work has been slow, first because there were no producers on the market that would make from bituminous coal a gas clean enough to permit of its being satisfactorily conducted through small permanent pipes, and second, due to the very low price of fuel oil and the small expense incident to its use.

Industrial Plants.

The first industrial plant attempted by us was a little plant at Baltimore, where it was impracticable to use oil on account of the small quantities required for the individual furnaces. The previous practice had been to use city gas. At the plant in question buttons and buckles are manufactured, and the gas is used for lacquering and enameling them. The temperatures are low, and producer gas is the ideal fuel. A very noticeable saving in fuel cost was shown. The plant has been operating for three years without trouble, and the owners are always glad to show it to any one interested in producer gas work. It might be interesting to know that this plant was operated for practically three years, and the fire was never out during that time.

Another application made is in a plant in which a 250 horse-power producer furnishes gas for tempering and hardening rollers for bearings. This is also small furnace work, and requires temperatures of from 1,600 to 1,800 degrees F. The plant was started, and all of the 16 or 18 furnaces rigged up and placed in commercial service in approximately two months. No further instructions in the operation of the plant have become necessary, and it has been operating about sixteen months effecting a saving of approximately $500 per month.

Data Relative to Brass Melting.

About three years ago Mr. Wm. Langsenkamp, a well-known foundryman of Indianapolis, Ind., called our attention to the problem of melting brass by the use of producer gas. At that time a 250 horse-power producer was being installed by us at the Langsenkamp plant (this producer), replacing an anthracite plant for power work. During the past year this unit has been replaced by a plant consisting of four units of 350 horse-power capacity each, making a total of 1,400 horse-power. The gas is used for power, baking cores and brass melting. We believe it is the most advanced producer gas plant in the country, and one of high commercial interest at this period of unrest on the oil question.

An average sample of city gas was taken, and its analysis made on a percentage basis. The same was done with producer gas. The heat units in a 100 cubic foot of city gas were calculated, and the quantity of producer gas containing the same number of heat units was determined. The weights of the various constituents of these two quantities of gas were then calculated, and the weight of air necessary for complete combustion determined.

Assuming complete combustion, the weights of the burnt gases escaping from the furnace were computed. From these results, and the specific heats of the products of combustion, the quantities of heat carried away from the furnace in the exhaust gases per degree, difference of temperature between inlet and exhaust were computed. This loss was then determined for various differences between inlet and outlet temperatures. To these amounts the loss due to the latent heat of steam formed during combustion was added, and the total loss subtracted from the original heat input.

This gave the quantity of heat available for heating the furnace at various temperature differences between inlet and outlet gas, both for city gas and producer gas. A curve was then plotted, from which, if the quantity of city gas heat units required to heat the furnace were known, the amount of producer gas heat units to do the same work may be read. It was observed that in each instance it requires more producer gas heat units than city gas heat units to maintain a given temperature. The reason for this is the fact that about 50 per cent. of producer gas by volume is nitrogen, and 10 per cent. by volume is carbon dioxide, both being inert gases.

It would be possible to plot a similar curve showing the comparison of fuel oil and producer gas. This, however, has not been done, for the reason that, in the first place, it is so difficult to procure a good chemical analysis of fuel oil, and, in the second place, we believe such a curve would approximate the one for city gas. The reason for this latter belief is that the added quantity of producer gas required in furnace operation is due to the presence of inert gases, as cited.

The excess loss in the case of producer gas increases with increasing furnace temperatures. To counteract this, steel makers build stoves through which the exhaust and inlet gases are alternately passed. To accomplish the same result, and at the same time to make the operation continuous, we have passed the inlet gas and air through the pipes, and allowed the exhaust gases to play on these pipes. This is our preheating arrangement for brass melting by which the inlet temperatures are increased, and the difference between the inlet and outlet temperatures become less, thereby reducing the heat loss in the exhaust.

Test Run Data.

From a test run of five days at Langsenkamp's, it was found that it required an average of 140 pounds of coal to melt 200 pounds of brass. Allowing 10 per cent. for stand-by losses in the producer, the actual coal consumption per heat is 126 pounds. Coal of 14,000 heat units per pound was used, and on a basis of 72 per cent. producer efficiency, there were available from each pound of coal 10,080 B.t.u. in gas. It, therefore, requires 126 multiplied by 10,080, or 1,270,080 B.t.u. in producer gas to melt 200 pounds of brass. The pre-heat obtained was approximately 700 degrees F, and the furnace temperature approximated 2,400 degrees F, giving a difference of temperatures between the inlet and outlet gases of 1,700 degrees F.

With this difference of inlet and outlet temperatures, it requires 1.34 times as many producer gas heat units as illuminating gas or oil heat units. Therefore, dividing 1,270,080 by 1.34, we obtain 947,820 heat units necessary to do this same work with oil fuel. On a basis of oil of 19,000 heat units per pound, and 6½ pounds per gallon, and an average of 7.4 gallons per heat of 200 pounds brass, we obtain 913,900 B.t.u., which figure agrees very closely with the above figure, 947,820, the difference being but 4 per cent. Seven and four-tenths gallons of oil per heat of 200 pounds brass is a good average figure for oil fuel operating between nine and ten hours a day.

This theory has been brought to your attention principally because of the great difficulty of convincing oil users who are accustomed to deal with small quantities of oil, of the large quantities of gas necessary to bring about corresponding results. Our estimates have been questioned time after time, and the foregoing analyses were made in order that we might have something tangible to justify our figures. The apparent excessive gas consumption has been attributed by some to improper burner design, but from the above analysis you will understand that such is not the case.

The practice of this plant is to use No. 70 crucible furnaces and operate ten hours a day. Owing to the fact that not only the furnaces, but also the preheater must be heated up each morning, the operating conditions are about the worst possible for a producer gas plant. If an economic advantage can be shown on this plant, certainly one can be shown on continuously operating plants.

From the test data, 140 pounds of coal were required to commercially melt 200 pounds of red brass. With coal at $3.00 per ton, the fuel cost is 21 cents. By actual test 7.4 gallons of oil are required to do this same work, and with oil at 4½ cents per gallon, the fuel cost is 33.3 cents. We found that two producers of 350 horse-power each would operate fourteen furnaces and produce 70 pots of metal per day of ten hours; therefore, on fourteen furnaces there would be a saving in fuel of 12.3 cents times 70, or $8.61 per day. Considering 300 working days per year, we could show a saving of $2,583 per year on fuel cost. A producer installation of two 350 units cost approximately $13,000, and the extra cost of preheater and gas furnaces over oil furnaces would be about $2,000, making an overall cost in excess of oil of $15,000. The labor to operate two producers will be two men at $2 a day, or $4 a day for 300 working days per year, or $1,200. The rest of the charges against the plant will be practically the same as for oil. A saving of $1,383 could, therefore, be shown on the overall plant per year. This represents 9 per cent. interest on the money invested.

The Furnace Output.

Now, it was found by taking the time of each individual heat during the test, that deducting the time for the first heat in the morning and its corresponding quantity of coal, the remaining heats required 100 pounds of coal per heat. The average time required per heat was one hour and thirty minutes. At this rate a furnace would be able to produce sixteen heats per day of 24 hours, and fourteen furnaces would produce 224 heats per day. With the oil furnace, the same number of heats could be obtained with a consumption of 6.5 gallons per heat. The comparison is as follows:—Two hundred and twenty-four heats at 100 pounds coal per heat gives 22,400 pounds, or 11.2 tons of coal, which at $3 per ton amounts to $33.60 per day. Two hundred and twenty-four heats at 6.5 gallons of oil per heat gives 1,456 gallons, which at 4½ cents per gallon amounts to $65.52 per day. The net saving in fuel cost per day for continuous operation will, therefore, be the difference between $65.52 and $33.60, or $31.92, and the saving per annum will be $11,401.20.

In conclusion, you will see that the gas producer melting problem for ten hour operation is approximately at a balance with oil at 4½ cents. Coal is a stable fuel as regards price, while oil is very unstable. The choice must be made by each user according to his best judgment. We cannot say definitely whether or not all brass melters should go to producer gas, but believe that each prospective installation should be carefully analyzed by competent engineers. From a paper read before the National Gas Engine Association.

Height and Area Features of Factory Buildings

Factory buildings of excessive heights or areas have long been recognized by underwriting organizations as a grave danger to life and property, owing to the difficulty of controlling fires in them. The evidence produced in this paper strongly supports the limitations advocated.

A PAPER entitled "Allowable Heights and Areas for Factory Buildings," was read recently by Ira H. Woolson, New York, before the American Society of Mechanical Engineers. The basis of the paper consisted of a summarised statement of replies received to inquiries pertaining to the subject sent out to five marshalls and five chiefs of towns and cities in the United States, of over 20,000 population. As the author aptly remarks, it is logical to assume that the men best fitted to determine safe limits of heights and areas are the men who have made a life work of combatting fires under all conditions of weather and hazard.

In the design of factory buildings, one of the vital features tending to control the spread of fire is a judicious limitation of height and area. It is self-evident that whatever restricts a fire reduces the life hazard. Owing to the supreme importance of these two subjects, a person contemplating the erection of a building of this class should give careful consideration to the history of fires in such buildings, and the experience gained in fighting them. The question is more acute in this class of buildings than in any other because of the fire hazard which exists in them, and because of the economic advantages due to reduced costs in construction and supervision, when several large areas are housed under a single roof. Just where to draw the line so as to produce reasonable safety without prejudice to building investments is the problem.

Extracts From Fire Chief's Letters.

The following extracts from letters received from different fire chiefs may be of interest, therefore, as indicating their attitude of mind in relation to the questions asked:—

"In my opinion, from a fire-fighting standpoint, no building should be built over eight storeys."

"In our city there is room to grow on the ground without building high in the air. It is almost impossible for a public fire department to fight a fire from the outside above 75 ft."

"The figures given mean that every 66 ft. by 66 ft. should have a brick wall through length of building with Underwriters' doors; same to be double. As for width, in no case over 66 ft. wide; with solid wall, same to reach above roof at least 6 ft. Build on ground not in air."

"A building 8 or 10 storeys high, out in the open where it can be attacked from all sides should be handled very readily by a modern equipped fire deparment."

"I think that a factory should never be more than four storeys high. I almost feel that there is no such thing as fireproof construction from my own experience. I know that it is possible to store enough material in any building to burn it. I am very much in favor of dividing rooms in factories with fire-resisting walls, provided with automatic fire doors."

"While fireproof construction is the best, it is the contents placed therein that are the hazard to life and property. Buildings should not be constructed to a greater height than can be reached by fire department ladders; 85 ft. to upper windows.

"In my opinion no warehouse building ought to be over one storey in height. In regard to manufacturing buildings, I will say that I do not approve of any of these buildings being over three storeys in height. If they want room, let them build in length and not so high; that is just what makes such bad fires. These buildings have all kinds of combustible material in them, and they are sure to jump to another building, if they are four or five storeys in height."

"It is my opinion that all buildings for manufacturing and warehouses should be sprinklered, and not built higher than what the water supply will furnish and cover."

"Do not think any fire department can successfully fight a large fire over six storeys high, and ten storeys allowed only when there are two sources of water supply with good pressure."

"Area of sprinklered and unsprinklered buildings should be about the same, on account of increase in height allowed for fireproof buildings."

"All buildings of character named should be sprinklered."

"Joisted brick construction should not be allowed without sprinklers."

"I think a good sprinkler system is one of the best fire preventions that has been invented in a great many years, and if kept up properly, it is pretty hard for fires to get away."

"If I had my way, I would not allow any manufacturing plant to do business until it were properly sprinklered. It does things when they should be done."

"My experience with the 28 factories in this city has been that the sprinkler systems are out of order much of the time. Not looked after properly."

"This department has had no unfortunate experience with the sprinkler system, but, I do not feel inclined to depend upon them."

"The reason for not showing more favor to sprinklered risks, is because our experience with sprinkler systems in this city has shown them to be unsatisfactory, and not to be depended on."

"Stairs should be of steel without any wood sides; if any wood in the construction then there should be sprinklers. Should be sprinklers in all elevators even if they are enclosed, for an elevator is a bad air shaft. Brick factories cut up with wooden partitions are generally hard fires to fight."

"I do not approve of small rooms in factories, they make it very hard for a fireman to fight his way through smoke trying to find a fire when a building of this kind is partitioned off so much."

"In considering the limiting of height and area of a building, the question of accessibility should play an important part."

TOOL STEEL.

A GREAT increase in cost, of late years, says a writer in the Machine Tool Engineer, is shown in the tool steel bill. This can only partly be accounted for by the difference in price of the high-speed steels and the rise in price of water hardening steels. A large part of the extra cost is generally due to the toolsmith not knowing the various correct treatments of the steels. Plenty of treatment charts are forwarded by the steel-makers, but in many cases these never reach the toolsmith for whom they are intended. Even when they do, they are not always worked to, and the instructions rigidly followed out as they ought to be. Before printing these instruction charts, the steel-makers go to considerable trouble and expense in making tests to get the best results, the chart being compiled on actual results attained.

Buying Tool Steel.

The reason usually given by the toolsmith for not working to the chart is that there are too many to work to, meaning that there are too many different sorts of steel in use, each having their own set of rules for treatment. This occurs when two or three people give the orders. In some cases one of them is a purely commercial man, often influenced in his choice by the apparent cheapness of a brand offered. To get the best results, the buying should be invested in one man, who should be capable of choosing the steel best suited for the work, and the efficiency of the machines.

Classes of Steel.

It is not economical even in the most up-to-date shops to use only one make of steel for all the different machine tools. It will be found possible to use a cheaper steel on the light lathes and machines, than on the larger types, and still get the full output. The machines should be divided into two or three classes, three at most, and a steel chosen for each class which will take the heaviest cuts the machines will stand. The toolsmith will only have three different treatments to learn, and will soon be able to get the exact degree of hardness for each; with the result that the tools will last longer, the machine men will work more comfortably, time will be gained by not having to take the tools so often to the stores to be changed, and repairs by the toolsmith and his striker will be less.

Exception to Classification.

A hard and fast rule should not be made that a higher-priced steel must not be used out of its respective class, the rule being intended only for the ordinary tools most often used and in large numbers. It is sometimes more economical to use the high-priced steel even for the small machines, as when a particular form of tool is required, which entails considerable labor in shaping, and a large number of articles have to be machined by it. Although the initial cost of the tool is high, it comes out small when spread over the large number of articles manufactured by its use. Its lasting qualities enable it to be used a longer time before being re-ground, and it retains its correct shape, enabling the operator to cut nearer to limit sizes. The water hardening steel will never be entirely superseded by the air hardened, especially in hand tools, such as chisels, etc.

Charles Warnock has been appointed sales manager for the Algoma Steel Corporation, Ltd., Montreal, Que., which will hereafter do its own selling instead of dealing through agencies. Mr. Warnock will have headquarters in the McGill Building, McGill Street.

The Reversing Electric Motor Drive for Planers, Etc.

The idea of applying reversing motors direct-connected for driving planers has been practiced for some 8 or 10 years, yet their application has been more or less of an experiment until about a year or so ago. The accompanying article dealing with the subject is taken from the Railway and Engineering Review.

THE use of the reversing electric motor drive, even in the first stages of its development, emphasized strongly that it possessed many advantages over older methods of reversing through clutches or belt shifters. Not only is the usual economy effected in the consumption of power through application of the principle of direct-connected individual operation, but maximum cutting speeds are sustained uniformly, acceleration is more rapid on the return travel, and a rate of production, hitherto unattainable, results. The reversing motor drive has ushered in new records in machinery castings.

Naturally, the effective performance of this drive has created a demand that has warranted exhaustive study and tests by manufacturers in developing it for commercial purposes. However, perfecting the reversing motor drive for reliable and successful operation has required time, and it, therefore, can be said to be of comparatively late origin. The General Electric Company has recently placed on the market a reversing adjustable speed direct connected motor drive that has been carefully tested and tried out in service.

Application Unlimited.

Probably the most interesting application of this drive to machine tools at the present time is to planers, viewed both in the light of an engineering achievement and from the standpoint of production. That a very large increase in output does obtain with planers through this means is now firmly established, and quite generally understood. The application of the reversing motor equipment in its various forms is almost unlimited. It is now used not only to drive planers, but also screw, worm and rack-driven slotters, turret lathes, wire and tube-drawing machinery, and other classes of machines reversed through clutches or shifting belts, which methods are often low in efficiency and high in maintenance. A desirable feature of the G.E. reversing motor drive is that it may be attached readily, wherever electric power is available, to machines already installed and in use, as well as to new machinery.

General Electric Co. Motor.

The motors for this service are mounted in any place on the machine or floor convenient for mechanical connection. They are of the standard General Electric commutating pole type with a speed range of 250-1,000 r.p.m. at 230 volts., up to and including 100 h.p. planer rating. These combinations of speed allow the motor in the majority of cases to be coupled direct to the driving shaft of the machine.

The Control.

The control consists of a contactor panel and master switch. The contactor panel is usually mounted on the side of the planer housing, or in any convenient place on other machine tools to which the drive may be applied. The panel is made up of eight contactors, similar in appearance to a series contactor, but actuated by shunt, series or differential coils in such a manner as to eliminate entirely electrical disc interlocks. An additional precaution is taken by using mechanical interlocks to prevent the possibility of short circuits. The panel, field rheostats and all accessories are enclosed in a cast-iron box, the cover of which is hinged, so that when swung open the contactors are easily accessible.

The box itself is pivoted about liberal openings in order that the rear of the panel may be swung into view for inspection when required. The leads are carried through these same openings, from either top or bottom, which prevents them from chafing when the panel is swung out. The field rheostat handles are brought out through the cover of the enclosing case and are plainly marked "cut" and "return." The pointers of these handles traverse a blank ring, which can be marked or graduated for cutting and return speeds in feet per minute.

The Master Switch.

The master switch is generally mounted on the side of the planer bed, or in other convenient place. The switch is simplicity itself, containing only contact figures, two forward and two reverse, one being used in common for both directions, and three segments on the drum, all of liberal proportions. Its sole function is to close the shunt coil circuits of the forward and return line contactors. The motor field is entirely external to the master switch. The panel is encased in a stout cast-iron box, so arranged that the parts and the wiring are most accessible. The master switch is operated by dogs on the planer table in much the same way as is now employed for shifting belts. A special double-pole C. P. circuit breaker is also supplied, which provides for minimum voltage and overload protection. In case the breaker opens or current fails through any cause, it automatically stops the motor, preventing the platen from coasting off the ways.

Starting, Stopping, Reversing.

By virtue of the commutating pole design of the motor, starting, stopping and reversing are accomplished with sparkless commutation. In order not to brake dynamically from high speed in one violent step, means have been taken to accomplish this in three distinct steps, braking down slowly from high speeds, and then quickening the brake action at lower speeds. This could not be accomplished with one step of resistance, for, at the lower speeds, the braking action becomes almost nil, dragging out the processes unnecessarily. Thus, the entire braking is completed in the shortest possible time without undue shock. This feature, in addition to quickening the brake, will be recognized as a decided advantage in the maintenance of the machine. Reversing is effected without the delay incidental to the use of sluggish relays. A noteworthy point in connection with the operation of this drive is that the planer reverses extremely close to a line at the end of the cut.

After voltage failures with the master controller in the running position, the motor will start up in the regular way, upon return of the voltage to the line without complications by closing the breaker. This operating characteristic is very desirable. Cutting and return speeds are entirely independent of each other, so that it is possible to use the slowest cutting speed and the highest return speed, or vice versa, in any combination not exceeding four to one, with thirty-five to seventy cutting speeds and the same number of return speeds, depending on the size of the equipment.

Existing Machine Attachment.

In the event of attaching the reversing motor to machines already in use, the speed of the driving shaft on the majority of planers will be low enough with the slowest cut to meet the motor speed of 250 r.p.m., and only a coupling and the necessary motor foundation will be needed. If, however, the planer gearing is of such a ratio that the speed of the driving shaft, when making the slowest cut required, is lower than the motor speed, 250 r.p.m., an intermediate gear and pinion have to be installed for the reduction. In the latter case, an outboard bearing should be provided, which can be taken care of either by motor shaft extension, or, if the standard motor shaft be used, by a special pinion with shaft extension for outboard bearing. Where the motor is coupled direct to a planer shaft driving through bevel or worm gearing, provision should be made for taking care of the thrust.

Suitable planer dogs are furnished in each instance, and should there be a boss or web directly behind the position of the operating lever, the bracket supporting the lever can be extended and mounted on a strap suitably bent for the purpose. The complete equipment comprises the circuit breaker, motor, contactor control with pendant switch, if desired, master switch, two dogs, main operating lever, auxiliary operating lever and bearings for the auxiliary shaft. On account of variance in location, bends and length in individual machines, the auxiliary shaft and the connecting rods from this shaft to the operating lever and master switch are not included.

Operating Features Summary.

Briefly summarized, the salient operating features claimed by the manufacturer for the reversing adjustable speed direct connected motor drive are: Maximum cutting speed sustained uniformly, affording greatly increased production; rapid acceleration on the return stoke; reverses remarkably close to a line at the end of the cut; very economical operation and upkeep; any speed desired within a ratio of four to one; many speed combinations, allowing the slowest cutting and highest return speed to be combined; freedom from shocks, permitting the quickest reversals possible without jar; quiet operation; sparkless commutation, and positive and safe control within easy reach of the operator.

METAL POLISH TABLETS.

SOAP, cut fine 16 parts; precipitated chalk, 2 parts; jeweler's rouge, 1 part; cream of tartar, 1 part; magnesium carbonate, 1 part; water enough. Dissolve the soap in the smadllest quantity of water, over a water bath. Add the other ingredients to the solution while still hot, stirring all the time to make sure of complete homogeneity. Pour the mass into a box with shallow sides, and afterwards cut into cubes.

Recent Judicial Decisions

Edmonton, Alta.—Ten thousand dollar's damage is claimed by Daniel Russ for injury to one of his eyes while, it is alleged, he was working for Pheasy and Batson, last November. During that month the complainant claims a belt in the factory struck him in the eye and caused it to be bruised, causing trouble.

Montreal, Que.—The law suit over the use of the word "Denis" in connection with the advertising of a sign business carried on by two distinct firms in the city has been settled, amicably. The Denis Advertising Sign Co. took action to force J. A. E. Denis to eliminate "Denis" from his advertisements, claiming that it was an infringement of the rights as granted them through their Act of Incorporation, and that they suffered great inconvenience through the action of Mr. Denis. The latter finally agreed to revert to his old firm name of the "Eagle Sign Company," and Judge Lane disposed of the case accordingly.

London, Ont.—The John McNee & Sons Cigar Co., of London and Windsor, is restrained, by an order issued by Judge Murphy on June 14, from interfering further with the business of the Memmeter Cigar Factory, of Detroit, by taking away its employees. The Detroit company brought suit at Windsor, alleging that Frank Boult, former foreman for the Detroit firm, had been persuaded to help the Canadian manufacturers establish a new factory in Windsor. It was alleged that he had taken with him valuable trade secrets and that he had enticed away valued employees from the Detroit firm. This was denied by the Canadian firm, although it was admitted that many Detroit cigarmakers had left the Hemmeter Co. to cross the river.

Toronto, Ont.—Claiming heavy damages on account of the alleged failure of a motor-driven grain chopper purchased at the Canadian National Exhibition last year, Alf. Livingstone, of Thistletown, is suing the International Harvester Co. before Chief Justice R. M. Meredith in the Non-jury Assize Court at the City Hall. On the witness stand, the plaintiff stated that he had purchased the machine upon the assurance that it would crush a certain amount of grain on the consumption of a given quantity of gasoline. This, he said, it had failed to do, with the result that he lost considerable business. Mr. H. M. Mowat, K.C., counsel for the Harvester Co., advanced the rather novel argument that the gasoline sold in Canada was of a much lower grade than that sold in the States, with the result that a great deal more of the Canadian variety was required in order to develop the same power. As the chopper was made in Milwaukee the guarantee was based upon tests made with American gasoline. He also argued that the plaintiff was incompetent as an operator, having had no experience with gasoline motors prior to his purchase of the grain chopper. No fault was found with the engine itself and a sample of the grain chopped by it was admitted to be excellent. His Lordship finally suggested that an expert be retained to present a report as to whether the engine could perform the amount of work claimed and the case was adjourned until this evidence is obtained.

BUILDING ON HABIT.

THE natural and most efficient scheme of conducting business is to build on habit. The specialist is superior to the Jack-of-all-trades. This fact has been known for centuries, but never before have conditions existed which have so forcefully demonstrated it. It applies to the business and commercial side of the industries as much as it does to the manufacturing side.

The skill of the workman is due to his continual application to his own particular work. A lathe hand cannot turn out his best day's work without his own lathe and his own tools, his own bench and work and general surroundings. Give him another lathe of even the same "make," and it may be days before he attains his previous record. Change his work frequently, and you have reduced his output. This condition

There is a misuse of energy when specialization is not practised, and in such dissipation of energies there has been wasted something that is of greatest value. The individual has had the pleasure of working very hard, but at the end of the week or year or life, it is clearly apparent that the plan of work has been faulty. It has gone contrary

We do a great wrong to men when we direct or restrict them to performing their work inefficiently. Congenial labor is, we know, one of the greatest blessings in the world. It is a greater blessing to the worker than to any one else, but it should be rightly directed by those in positions to direct. If it is allowed to be expended in effort that goes contrary to all natural laws, there is a great loss to the world, to the industry and to the man. The drone is of more use to the world than the man who misdirects labor.—James Hartness in the Transactions of the Efficiency Society, Inc.

Place and Necessary Qualification of the Salesman*

By W. T. Todd**

In this progressive age, the race for commercial supremacy or business leadership is one in which the commercial salesman or representative of the house plays a very important part. Unless he measures up to the high standard required, and has the necessary qualifications, he cannot expect to reach the goal, as, in the end, it is usually a case of the survival of the fittest.

IN my 30 odd years' experience in the supply line, I can truthfully say that the prizes in business to-day go to the men who keep profitably busy as a result of their own initiative. There are too many men who do passably well what they are told to do, and when they have finished the task, inquire helplessly — "what next?"

Initiative Feature.

Don't be a train car, always following —depending ever on the man ahead for your ideas and motive power. Be your own accelerator. Get up your own speed. Look for tasks ahead. Keep records of things to be accomplished—remembering that the world is full of people who are "waiting for something to turn up." Believe in yourself; in the goods you sell; in the house you represent; in the hands that create; in the brains that think; and that when you have made a sale, you have also made a friend. Believe in cheerfulness. Get rid of the frown. Don't worry. If anyone has to have a grouch, let it be your competitor—you do the smiling. It is easier to find successful men than failures, because those who succeed are in evidence, while those who fail pass into oblivion.

Impress Your Customer.

Did it ever dawn on you that the organization you represent, as well as the various manufacturers, whose merchandise they handle, manufacture a class of goods that are absolutely essential to the men upon whom you call, and that, with such a wide line from which to choose, the successful salesman should be able to select some particular article that would appeal to his customer and enable him to leave a lasting impression behind, as well as securing orders.

In starting on each trip, why not select some article of merit and frame up an interesting talk, and spring it on your customer? Then, in calling on your man, instead of the usual "Just dropped in to see if there was anything wanted this morning," and the reply, "Can't think of anything to-day"—spring your story; get him interested for five minutes, instead of five seconds, and perhaps walk away with an order or with at least having left a pleasant impression behind and something for him to ponder over. This method faithfully followed up will soon show results and command the respect of the buyers. You will find some of them asking you for advice regarding the selection of certain goods, when they realize fully that you know something about the article which you are selling and that you are not simply an "order-taker."

Seeing the Practical Man.

Sometimes it is necessary to see the man behind—the practical man who keeps in touch with new developments. Usually this is not an easy task. He may be located in an obscure place, and cannot be reached through the office, and you may have to wait for him on the street or perhaps at his home; but on the whole he is much easier to approach and get acquainted with than the man in the front office. When you have met him, and explained the merits of your article—what a different aspect it will place on the selling to the man in the front office. Before, you found yourself permitted to submit prices (which in turn were picked to pieces by the buyer, to meet some other competitive figure, which, in some cases was an imaginary one); now you have an opportunity to talk quality, and show the practical man wherein your article is superior and better suited to his particular requirements, regardless of price; and when the "order-placer" tries to drive you down you can simply smile and stick to your price, usually with satisfactory results.

Service Feature.

The basis on which goods are sold today is "service." The price at which the goods may be sold depends upon the service the goods will be to the buyer. The value of the salesman in dollars and cents depends upon the service which he is able to render both the customer and the house he represents.

Truth and Honor.

Any business, to grow and be successful, must treat its customers fairly and honestly. A cute trick may give slight temporary advantages, but the foundation of the house must be laid with strict integrity and honesty of purpose, if customers are to be retained and repeat orders expected and their numbers multiplied as the years roll by. When a salesman recommends a certain article for a certain class of work, he should do so with strict integrity; and the goods must be right for the purpose intended and must be honestly sold, thereby making the transaction mutually beneficial to both parties. Under these conditions, the customer soon forgets that he paid a good price for the article, but will never forget the salesman or the house he represents, that made good; and when in the market again, he will then have an opportunity to serve him and also recommend him to his friends. This requires, in all cases, not only the hearty co-operation of the salesman with the organization he represents but also the very best individual efforts of each one having any part in the transaction.

To give your customer the best you know for the smallest safe price, is the best general proposition to-day.

Individuality.

The successful salesman must assert his individuality; if he does this he will gain confidence in himself day by day and will be able to talk a thousand-dollar proposition as forcibly and well as the most trivial article he has to sell. When a man's personal appearance deteriorates, he becomes timid, loses steam and can't "talk up" his goods or service with enthusiasm; he becomes self-conscious and belittles himself in his own mind and, therefore fails to make good. In short, "clothes do not make the man" but neat, up-to-date and proper clothing gives him the proper self-confidence so essential to a progressive salesman.

Everything, no matter what, depends on the Man. The one thing in the universe that refuses to stay in its pigeonhole is a human being. After all, the only thing about a man for which the world care sin his Individuality. Your accomplishments and possessions do not matter much. It is the "Pearl of great price," the one treasure he has which no one else has. In art, it makes one's work great; in letters, it makes one's writing worth reading; in business, it is the touchstone of success; in society, it is the secret of popularity; in love, it is the very core and substance, and in religion it is the keynote. All true education is to develop this; all true cul ture is to perfect it; all true religion is to keep it unspoiled. "What shall it profit a man if he gain the whole world and lose—Individuality."

Confidence.

One of the greatest advantages to a salesman is Confidence. In fact, busi-

*From an address given before the Society of Steam Supplies Salesmen, at Pittsburg, recently.

**Secretary, the Somers, Fitler & Tod Co., Pittsburg.

ness is built on confidence. Give Confidence, and you will win Confidence; and your material reward is certain. Before a sale can be consummated, the buyer must trust the seller. Having, now, secured confidence, it can only be retained by the pursuance of square dealing; the keeping of promises; in fact, "delivering the goods."

The salesman who makes no effort to win Confidence makes few sales and lacks that faculty which enables him to meet the buyer on common ground. Too many salesmen see only the immediate sale. Too many forget that the customer must be looked to in the future for repeat orders, and make promises that their house cannot fulfill. The successful salesman looks further ahead. He sees the sale that will be made to the satisfied customer's friend on his recommendation; and that future business will result from satisfying and commanding the confidence of everyone dealt with.

Without Confidence, this world would be in a turmoil; great enterprises would not be started; credit would vanish; therefore, Mr. Salesman, seek to win Confidence.

Good Will.

Good Will is a most valuable business asset. It is indispensable to healthy growth and success. How to increase it or build it up should be a subject that the successful man should never lose sight of. No business ever suffered from an oversupply of it. Courtesy, attention, sincerity of purpose, honest methods, good values, and being able to supply what the trade needs and wants, all play their part in building up this incalculable asset, Good Will.

Business success or failure are both due to definite cause; not to luck, as some people imagine. The salesman who hopes for a stroke of luck to raise him above his fellowman is usually disappointed; and one of the biggest causes of success is sincerity of purpose, which consists of high ideals and an ambition to render the highest grade of service apart from the financial returns. Nothing great was ever accomplished by the sole incentive of financial reward. Every man who has accomplished something or been successful, will tell you that he never lost sight of the fact that he was working toward a certain point—a goal.

Offer to your customer the advantage of dealing with a house which will maintain at all times a high standard of quality in the goods it sells. Offer him prompt and efficient service. Show him that he will at all times be treated with uniform courtesy, honesty and fairness. Display a pleasing and enthusiastic personality as well as an accommodating disposition, coupled with an ability and a readiness to serve on the part of your house and make it clear that your prices are uniformly right, and as low as is consistent with good quality and efficient service.

Ability Feature.

The salesman of to-day should possess large abilities and should be familiar, not only with his own line of goods, but also sufficient of his competitors' line to enable him to handle conditions when they arise. A salesman may have a first class article to sell at a given price, which is a fair price, while his competitor may have an inferior or substitute article somewhat similar, on which he is able to quote a lower figure; and if the salesman is not familiar with his goods and those of his competitor, he is inclined to meet his competitors' figures, throwing away good, legitimate profit to which his house is entitled and lowering his own ability as a salesman.

Study, therefore, the line you are selling and so demonstrate to the buyer the quality and service you have to offer as to put the question of price secondary.

Knowledge of Your Business.

The successful salesman must have a thorough knowledge of his business; be a man of stability, strong character and backbone, energy, enthusiasm, good health and morals, honest and sober. Those who lack confidence in their ability to sell at an equal or better price than their competitors, seek the line of least resistance, viz., a concession in price to effect their sales, which finally leads to their elimination from the selling ranks. A courteous declination to meet a cut price will often enhance the buyer's respect for the salesman and the house he represents. While, on the other hand, a too ready compliance with demands for lower figures will neither command respect nor the confidence of the trade in general.

One of the ruling powers in any business organization is public opinion of the character or reputation of the company for honesty and fair dealing; and this public opinion is determined by the salesman and by every individual who helps to make up that organization.

Reputation Building.

The salesman sometimes forgets the fact that in the daily discharge of his duties he not only represents himself, but that in the eyes of the people with whom he comes in contact, he is reflecting the attitude of his entire organization and building a reputation for both according to his actions. Having the future welfare and advancement of his company in mind, he should establish a reputation for honesty and square dealing that will prove a most valuable asset —one of incalculable value, that will compound as the years roll by, and is bound to bring successful results, both to himself and the company he represents.

ELECTRIC LOCOMOTIVES.

NINE electric locomotives of 1,400 horse-power normal rating, and capable of being overloaded up to 5,000 horse-power, have been ordered by the New York Central Railroad Co. They are claimed to be the most powerful locomotives yet constructed. The tractive effort will enable a 1,000-ton train to attain 60 miles per hour. The type of construction adopted is that of having a motorman's compartment at either end with contractor gear, resistances, brake compressors, etc., housed midway in a central compartment. The coach is supported upon the centre pins of the two portions of an articulated frame, each portion running on two fixed axle trucks. The motors, which are eight in number, one to each axle, have a continuous rating of 260 amperes at 600 volts under forced ventilation, and 325 amperes for periods of one hour; the current being collected by eight underrunning third-rail shoes.

Two pantagraph type overhead trolleys are also fitted for use on sections where the third rail is not installed, these being operated from the motorman's compartment by foot lever control pneumatic gear. The forced ventilation for the motors is obtained from compressors, the air being driven through the box form type of girder and down through the hollow centre pins on which the coach is supported. The weight of the cars is 100 tons, and the entire length of frame 22 ft.

GREAT LAKES WATERWAY.

IF plans which Mayor Clay, of Windsor, Ont., proposes to submit to the Convention of the Union of Canadian Municipalities of Saskatoon, on July 17, are carried to a successful conclusion, Windsor, Detroit and other cities on the Great Lakes may become ocean ports.

He intends to submit a proposal to present a memorial to the Dominion Government urging the deepening of the Welland, Rideau and other canals to perfect a waterway from Lake Superior to the sea. This would make possible the navigation of ocean vessels to the extreme end of the great lakes and settle a problem now prominently before the Dominion.

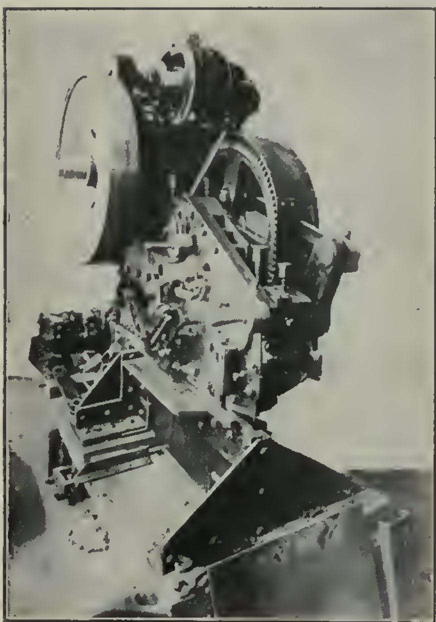
The mayor believes the United States would contribute toward the financing of this scheme, as American ports along the lakes would benefit as much as those on the Canadian side. The Great Lakes Waterway Route has all the advantages of the Georgian Bay Canal, and besides would tend to build up existing lake ports. If the plan he will submit be adopted, the industries of Canada would be built up through increased facilities for foreign trading. Foreign shippers would also benefit.

DEVELOPMENTS IN MACHINERY

A Record of New and Improved Machinery Tending Towards Higher Quality and Economical Production in the Machine Shop, Blacksmith Shop or Planing Mill.

TRIPLE COMBINED PUNCH, PLATE SHEAR AND BAR CUTTER.

AN example of centralization of manufacturing processes in one machine is the triple combined punch,



TRIPLE COMBINED PUNCH, PLATE SHEAR AND BAR CUTTER.

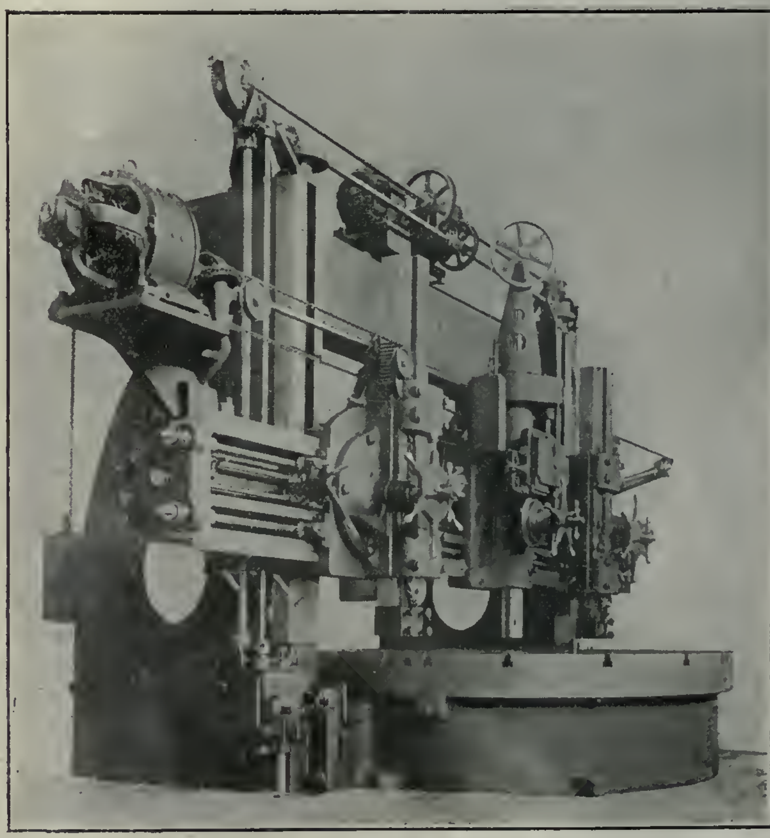
plate shear and bar cutter, built by Henry Pels & Co., 90 West Street, New York City. The splitting shear will split plates up to ½ inch, any length or width, or bars up to ⅝ inch. The bar and angle cutter, shown in the centre of the machine, will cut rounds and squares up to 1½ inches; angles and tees, 3 by 3 by ½inch; and angles on a bevel of 45 degrees, up to 2 by 2 by ¼ inch. The bevelling of angles is accomplished without any change or adjustment of the knives for either right or left hand bevelling. With interchangeable knives, beams or channels up to 5 inches can be cut on this end. The punching end is built with any depth of throat from 12 inches up to 30 inches on standard machines. The machine will punch ⅞ inch holes through ½ inch material, or equivalents. The punching end is equipped with a removable block for architectural jaw, to punch in flanges of structural shapes.

All three tools of the machine make 25 strokes a minute; the 3½ h.p. direct-connected Westinghouse motor, with which it is equipped, being capable of driving all three tools simultaneously at their maximum capacities. The net weight of the machine, including the motor, is 3,250 pounds. The frame is constructed of a single plate of forged steel of high tensile strength. This construction is considered to be the strongest and most up-to-date known. All slides and plungers are of forged steel, and all bearings are phosphor-bronze bushed. The flywheel shaft has an adjustable ring oiler bearing, and the power is transmitted by means of a semi-steel gear crown bolted to the flywheel through a rawhide pinion on the motor shaft.

RAPID POWER TRAVEL BORING MILL.

RAPID power travel in heavy boring and turning mills is always an important factor. This has been accomplished by the application of a separate motor drive 10 on the 10 ft. machine manufactured by the Betts Machine Co., Wilmington, Del. This machine swings 10 feet 4 inches in diameter, and takes in work 62 inches under the toolholders. It is provided with power rapid travel and all-gear feed to heads, giving absolute control. The workman, without moving from the head, can operate his quick power travel to head and spindle in either direction. He can change from power travel to feed, and vice versa. The feeds can be operated in either direction, and the tools set to size the work. The machine is equipped with a motor-driven central boring head, which has a revolving spindle with independent drive and feed mechanism. Limited lateral movement is provided for the purpose of doing other than central boring.

The mill is driven by three Westinghouse motors—one of 20 h.p., 400-1,200 r.p.m., for the main drive; one of 5 h.p., 400-1,600 r.p.m., for the central boring head; and one of 5 h.p., 1,130 r.p.m., for the cross rail elevation and power travel. The total weight of the machine, including motors, is 80,000 pounds.



RAPID POWER TRAVEL BORING MILL.

MACHINERY EXHIBIT AT ATLANTIC CITY.

CONCURRENT with the recent conventions of the American Railway Master Mechanics' and Master Car Builders' Associations at Atlantic City, N.J., the Railway Supply Manufacturers' Association held its annual exhibition of machine tools, railroad appliances and accessories. The space occupied amounted to 88,200 sq. ft., being an increase of some 4,700 sq. ft. over last year.

The Million Dollar Pier housed all the exhibits, with the exception of a few under canvas, and on convenient railroad tracks and the registered attendance at both conventions was in the neighborhood of 5,000. Much interest was taken by those attending the conventions and by the general public, in the exhibition, particularly with reference to equipment in operations. The following officers were elected for the ensuing year by the Railway Supply Manufacturers' Association:

President, Benjamin A. Heganman, Jr.. U. S. Metal & Mfg. Co.; vice-president, J. Will Johnson, Pyle National Electric Headlight Co. Members of the executive committee, C. B. Yardley, Jr., J. C. Currie, C. F. Elliott and Joseph H. Kuhns.

C.P.R. 1913 IMPROVEMENTS EXPENDITURE.

ONE hundred million dollars will be spent on improvements to the Canadian Pacific Railway System this year, according to an official statement made by Sir Thomas Shaughnessy on June 27. This will mark a record in expenditure for the C.P.R. Sir Thomas' statement in part is as follows:—

The company's appropriations for the construction of additional railway mileage, for cars and locomotives, terminal facilities at St. John, Montreal, Toronto, Fort William, Winnipeg, Calgary, Vancouver and elsewhere; for ocean steamships and hotels, extensions of the telegraph system, shops, sidings and improvements generally in Canada, will approximate no less a sum than $100,000,000.

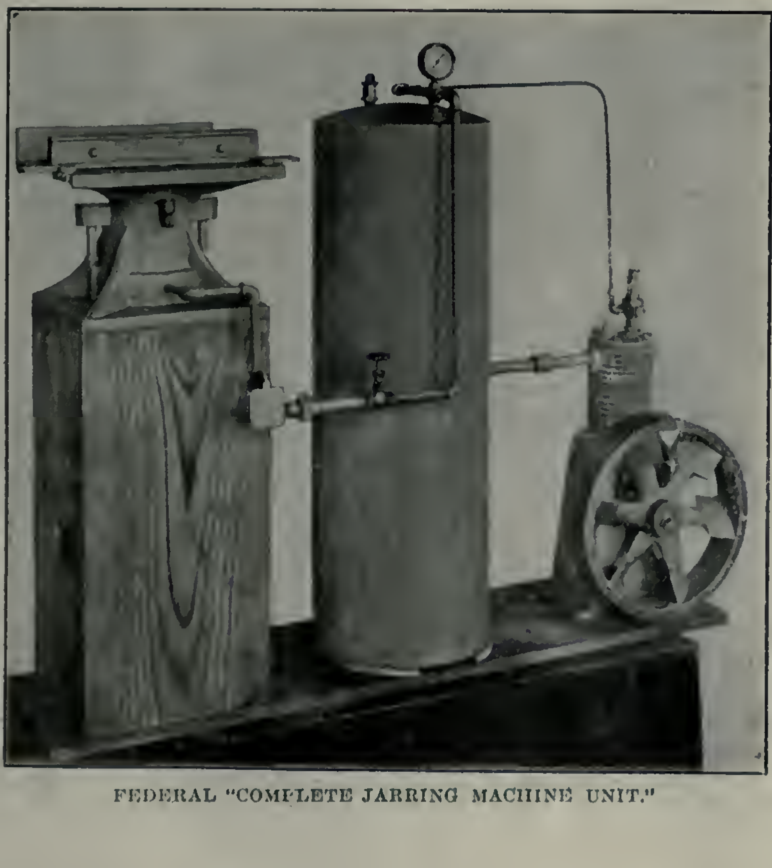
JARRING MACHINE UNIT.

THE Federal Core-Jarring Machine is designed for bench core making, and the illustration shows a unit which has been made up specially for foundries not equipped with a compressed air service.

The outfit consists of a No. 1 core-jarring machine having a table 12 ins. x 12 ins., a 3-inch cylinder of a working capacity of 300 lbs., a 3 in. x 3½-in. air compressor, receiver and governor. To ensure the success of this unit great care has been taken in designing a suitable compressor; one special feature being the suction valve, which is of the disc type, the disc being made of vanadium steel. The valve is raised off its seat just as soon as the piston starts on its downward stroke, allowing the air to rush into the cylinder, consequently no power is used during that stroke. The compressor is of sufficient capacity to operate five machines.

The jarring machine is made in two sizes, the tables being 12 x 12 ins. and 18 x 18 ins. respectively. It should be set up preferably on a wood block, and not attached to the bench, as it is undesirable to communicate vibration to the latter. The table is fitted with a flange at the back, which acts as a stop for the core box. There is also an adjustable clamp which slides on from the front until its ratchets engage with the side notches nearest the core box. Two strong springs take up the slack. This makes a very quick and secure method of holding the core box in position. The operator controls the air for working the machines by means of a knee lever, leaving both hands free to fill the box. Several core boxes of irregular shapes can be worked on this machine at the same time.

The unit is manufactured by the Federal Foundry Supply Co., Cleveland, Ohio.



FEDERAL "COMPLETE JARRING MACHINE UNIT."

BOVING & CO. OF CANADA, LTD.

THE business of the Canadian Boving Co. is now being operated under the title of Boving & Co., of Canada, Ltd., in order to bring it into line with that of the other branches of Boving & Co., Ltd., London, England, which are operating in Japan, New Zealand, Brazil, Mexico, etc. Owing also to the great increase in the volume of business, and to their having purchased the works of the Madison-Williams Manufacturing Co., of Lindsay, Ont., the capital of the company has been increased to $1,000,000, a portion of the first issue having been found in Canada. They are now in a position to turn out in their Canadian works the following machinery:—Water turbines, centrifugal pumps, pulp and paper making machinery, sawmill machinery. Of the above, the centrifugal pumps have been hitherto made in England; the water turbines, pulp making and paper making machinery in Sweden; while the sawmill machinery has been manufactured by the Madison-Williams Co. in Lindsay.

The Canadian Boving Co. completed their first large plant in Canada in 1910, viz., water turbines of some 8,000 H.P. for the Calgary Power Co., and other important contracts which have since been executed are:—

City of Winnipeg—5 double horizontal open flume Francis turbines of 23,000 h.p.; and 2 double horizontal enclosed Francis turbines (exciters) of 900 h.p.

The Sydney Power Co., Trenton, Ont.—4 double vertical open flume Francis turbines of 6,000 h.p., and 4 double vertical open flume Francis turbines of 4,800 h.p.

Chicoutimi Pulp Co., Chicoutimi, Que.—2 double horizontal enclosed Francis turbines of 8,000 h.p.

Town of Farnham, Que.—2 double horizontal open flume Francis turbines of 1,130 h.p.

Town of Welland, Ont.—1 turbine of 250 h.p.

St. Francis Hydraulic Co., D'Israeli, Que.—1 double horizontal enclosed Francis turbine of 1,600 h.p.

Carillon Construction & Development Co.—1 turbine of 300 h.p.

City of Penticton—2 turbines of 380 h.p.

Ocean Falls Pulp Co.—6 single horizontal enclosed Francis turbines of 10,800 h.p.

Centrifugal Pumps.

Centrifugal pumps with capacities ranging from 220,000 to 54,000,000 gallons per 24 hours, and operating against heads of from 44 to 440 feet, have been supplied to and installed for the following municipalities, mining, and manufacturing concerns:—

City of Toronto, Nipissing Mining Co., Montreal Water & Power Co., City of Welland, Ont.; Delta Municipality, City of Moose Jaw, E. B. Eddy Co., Hull, Que.; City of Prince Albert, Town of Preston, Ont., etc. A considerable quantity of pulp making machinery has also been installed.

The experience gained during the past three years by the Canadian Boving Co. has enabled them to gauge the Canadian market, to familiarize themselves with what is actually required by and most suitable for that market, and by reason of their having let out contracts for various details of plants to Canadian firms they have been able to form an accurate idea of the cost of manufacturing such plants in the Dominion.

The Canadian company is working in close alliance with Boving & Co., Ltd., Union Court, Old Broad Street, London, England, to whose designs their machinery will be manufactured with such modifications as may be necessary to suit Canadian requirements.

Boving & Co. of London, England, have carried out some very large hydro-electric contracts, including work for:—

The British Aluminum Co., Ltd., London.

The Waihi Gold Mining Co., New Zealand.

Mt. Lyell Mining & Railway Co., Tasmania and London.

Hydro-Electric Power & Metallurgical Co., Tasmania.

Kinguawa Hydro-Electric Co., Japan.

The City of Kyoto, Japan.

The Sagami Hydro-Electric Power Co., Japan.

The Governments of Western Australia, New Zealand, Egypt, Soudan, India and others, and the London County Council, while they are also on the Admiralty and the India Office list for the supply of hydraulic machinery.

The existing works are quite up to date, having been built in 1906. Large additions, however, will be made to them immediately, so that, in twelve months' time, the capacity will be about four times that of the present shops, and a number of new and up-to-date machine tools will be added so as to ensure the most accurate workmanship, as now required for modern machinery. Furthermore, they will be in a position to give prompt deliveries, and possibly improve on their prices, whilst maintaining the same high standard of efficiency and design which has always been their aim.

U.S. IRON ORE PRODUCTION IN 1912.

THE iron ore mined in the United States during 1912 amounted to 55,150,147 gross tons, compared with 43,876,552 tons mined in 1911, an increase of 11,273,595 tons, or 25.69 per cent., according to an advance statement by Ernest F. Burchard, of the United States Geological Survey. The production of 1912 was second only to the output of 1910, falling 1,864,759 tons below the record production of that year, which was 57,014,906 tons.

Ore Marketed.

The total quantity of ore marketed in 1912, according to reports received, was 57,017,614 tons, valued at $107,050,153, compared with 41,092,447 tons, valued at $86,716,575, in 1911. The average price per ton in 1912, according to these figures, was $1.88, compared with $2.11, in 1911. This represents the selling value of the ore f.o.b. at the mines, but does not include any freight costs. The extreme range in values in 1912 was between $1.01 a ton for red hematite, and $3.70 for brown ore. The average price for red hematite in 1912 was $1.87; brown ore averaged $1.79, magnetite $2.18, and carbonate ore $1.96.

According to the reports of producers, many of which have been somewhat revised since the report for 1911 was published, the total quantity of iron ore in stock at the mines at the close of 1912 amounted to 10,241,287 tons, compared with 12,206,390 tons at the close of 1911, a reduction of 1,965,103 gross tons, or 16.1 per cent., which balances closely with the excess of sales over quantity mined.

The Foundry & Machine Exhibition Co., C. E. Hoyt, secretary, has issued from the secretary's office at Chicago its 1913 prospectus. It is a well printed pamphlet of 96 pages $6\frac{1}{8}$ x $9\frac{1}{4}$ in., announcing the exhibition which is to be held at the International Amphitheater, Chicago, October 10-17. A plan is shown of the exhibition floor containing 75,000 sq. ft. of exhibit space, and there are general views of the exhibits at Buffalo and Pittsburgh in the past two years.

Leamington, Ont.—The Ruthven Cold Storage and Forwarding Co. have built a large plant here, and will start operations shortly.

VALUE OF EFFICIENT ADVERTISING.

WE cannot say much more than we have already said along efficiency lines, but we can point to the fact that advertising changes the habits of the nation. We know it is not much understood, and it has been indicated here and elsewhere in the public prints that its importance is not appreciated. In a Senate report on the 'High Cost of Living,' eager to avoid the tariff and other things, they seized upon advertising as a scapegoat, to explain the increasing cost of living.

In the annual report of the leather company, we find that recently their affairs have not been prosperous and conditions were not good. They do not advertise; but referring to the packing companies, as large and as uncertain, and as dependent upon general conditions as the leather company, we find that owing to their advertised by-products, their profits have been conserved and they are paying a dividend.

By advertising we have made a clean nation. The soap publicity has changed the habits of the country. The constant picturing of the bath-tub has changed the nation in that respect, because we have trained the public ideal in the direction of bath rooms, sanitary, cleanly and wholesome surroundings.

A few years ago, in the average town of this country, the young man's ideal was to have a good horse, a buggy and a ten dollar whip; but his clothes were of secondary consideration. Then our tailors started picturing good looking, well-dressed young men around the town, and to-day they have changed the thoughts of young men everywhere, and they wear well recognized brands of clothing. their care in personal appearance has brought with it self-respect in other things. Advertising needs your fostering attention and development in the consideration of the efficiency movement. It is a power for good, a power for practical education and a power for industrial activity."

So writes Wm. H. Ingersoll in his paper on Advertising, which appears in the first volume of Transactions of the Efficiency Society, Inc., a volume containing matter of great value to all men, no matter what their life's work may be.

Where Carbon Boils.—It is held that when an electric arc light hisses, the carbon, melted from one of the rods, is actually boiling in the little crater formed in the end of the rod. The superheated liquid, with blinding flashes of light, moves and jumps about very much as water does on beginning to boil.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

PREVENTING SORE THUMBS WHEN FILING.

By J. E. Cooley.

IT is commonly known among those who do any considerable amount of filing on a lathe, that the constant handling of the file rubs the skin from the thumb, and makes it very tender. Many machinists use a thumb-glove, or a square piece of leather having a string

PREVENTING SORE THUMBS WHEN FILING.

tied across so that it will slip over on the thumb. While these serve their purpose well, they are clumsy, besides they are in the way when putting in or removing the work from the lathe. If the file is ground slightly, concave on the end, as shown in the sketch, there will be no more sore thumbs. The teeth on the extreme end of the file are useless in lathe work any way.

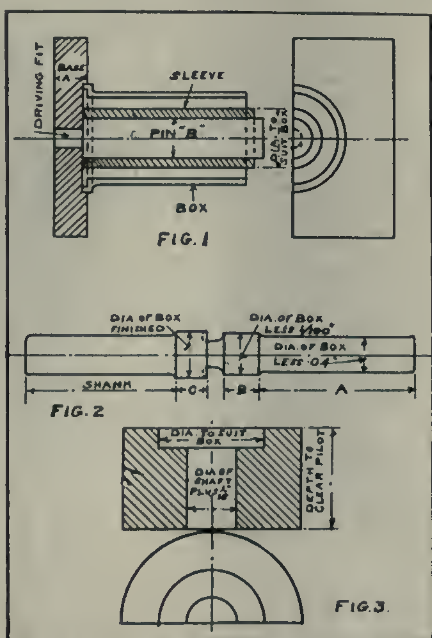
BABBITTING AND BROACHING BEARINGS.

By George Black.

IN babbitting bearings it will frequently be found when the bearing has cooled that despite the careful preheating of the box, the anti-friction metal is loose therein. due to shrinkage. The obvious remedy is to expand the metal into the box, thereby making it solid, and this is accomplished, as a rule, by "peaning" the babbitt with a hand-hammer—at the best an unsatisfactory job. With the assistance of the jig for babbitting, and the tool for expanding the metal and subsequently broaching the bearing, here described, a first-class job is effected, the metal in the bearing being solid, the exact size required, and with a glass-like finish. The method is particularly applicable to the solid bearing boxes of armatures and the heavy split type of axle box bearing, but can be applied to any bearing which is faced on one end, and where the box is sufficiently strong to resist the bursting strain incidental to expanding the metal.

Fig. 1 shows a section of the jig used for babbitting. (A) is the cast iron base which is recessed for the end of the box to fit into, and bored a driving fit for a mild steel center steady pin; (B), the sleeve; (C) is of steel, and is made a sliding fit on (B), while the length of the sleeve is one inch longer than the longest box to be babbitted. The outside diameter is made to suit the various diameters of shafts, less 3-64 in., and has a slight taper from the bottom to the top of 1-32 in. per foot; this taper facilitating the withdrawal of the sleeve from the box after babbitting. It will be noticed that the bottom of the sleeve is cupped out, leaving a bearing 1-16 in. wide at the edge. This was done to allow the sleeve to sit down snug on the base plate (A) and prevent the metal running under the sleeve. The method of using the jig is as follows:—

Select the size (outside diameter and length) of sleeve suitable, and slip over center pin of jig. Place box in position and fill with babbitt. As soon as the metal has "set" lift up box—the sleeve coming with it, and turning it end for end, jar the small or top end of the sleeve against the bench or a block of wood, and the bearing will start from the sleeve, allowing the latter to be withdrawn and replaced on the jig ready for the next box, and leaving the box which has been babbitted ready for the next operation of expanding and



BABBITTING AND BROACHING BEARINGS.

broaching. The combined expander and broach is shown in Fig. 2. (A) is the pilot, which is of sufficient length to ensure alignment of broach and bearing. The diameter of (A) is 1-16 in. less than the required diameter of box. The upper part (B) of the pilot is the expander proper, and its diameter is 1-100 in. less than the required finished diameter of box. Immediately following the expander will be noticed the cutting edge of the broach (C), which is of the required diameter.

Fig. 3 shows the cast iron blocks used to center the bearing and support the anti-friction metal during the broaching operation, which is performed with a hydraulic press. Unless the anti-friction metal is so supported, there is a tendency to break its edge away when the broach is coming through. Bushes can be made to suit different diameters of broaches to fit the block in Fig. 3. The use of this tool needs no explanation, and a first-class job in all respects is the result, with about one-quarter of the time only necessary, as compared with the old method.

TO PROPERLY KEY A PULLEY.

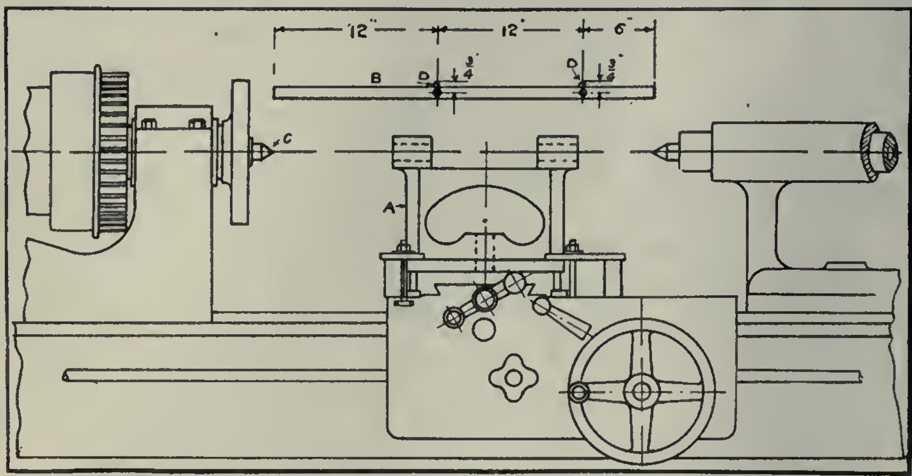
IT is something of a trick to key a pulley so that it will not work loose after a time, especially if the pulley is large, and runs at a high rate of speed. In making the key, care must be taken that it be of uniform width, and fit the seat in the shaft and the pulley snugly. The key should be driven tight, but not so tight that it will kink under the blow. If the pulley runs with the hub against the box, which is the usual way, allow only about 1-32 in. end play between the box and the pulley.

When an old key is worn too thin, but fits properly otherwise, place a strip of tin under it to make it fill the keyway closely. To draw a key, a small end of which is projecting, hold it with a pair of pliers, pry against the hub of the pulley, at the same time driving the hub on the shaft with a hammer. This will loosen both the pulley and the key. If the key is cut off flush with the pulley, it may be necessary to remove the shaft and drive from the inside, in which case it is well to drive the pulley on a little, to loosen the key.

SOLUTION TO BORING PROBLEM.

By A. P. C.

THE problem in boring, appearing in the June 26 issue of Canadian Machinery is one likely to give rise to an interesting discussion by men in our machine shops, and argument, such as this apparently simple question brings out, is always beneficial. While most of the men, primarily interested, if not



A PROBLEM IN BORING—SEE LAST WEEK'S CANADIAN MACHINERY.

all, are now convinced as to the final answers to the several questions involved, mechanics at large might be interested to have our views on the subject.

(1)—In the first place it would be practically impossible to line the work up with the centres out of true, because in setting the surface gauge to the proper height, which centre could you use? For accurate boring, the centres must be in line, both vertically and horizontally in relation to the shears of the lathe, or the travel of the saddle.

(2)—Fig. 1 shows an exaggerated sketch of the question under consideration. The length of the boring bar being 30 inches. The difference in height of the two centres is 1-16 inch, and if X=the difference in height of the two tools, then

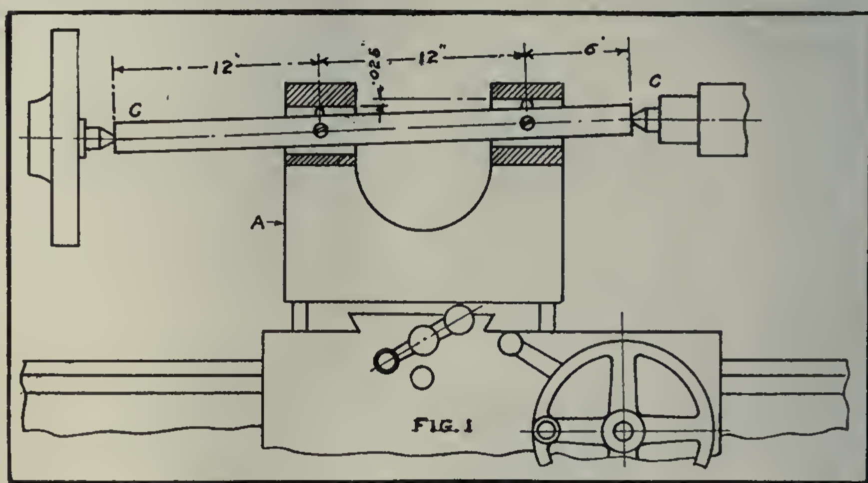
X : 1-16 : : 12 : 30 or

X=1-16×12-30=1-40=.025 inch.

(3)—Therefore, the right hand hole would be .025 in. higher than the left, although parallel with each other and parallel with the base.

(4)—As the bar has no traverse motion, being revolved upon the centres, and the tools will always remain the same radius from the centre of motion, therefore, the holes cannot be tapered.

(5)—Their true cylindrical form brings to a somewhat finer point of argument. Some may say that the holes would be round, or as round as it is possible to get them. While this is true, and the error almost infinite—yet, with the centres out of alignment, it must surely be there, Just the same.



SOLUTION TO BORING PROBLEM.

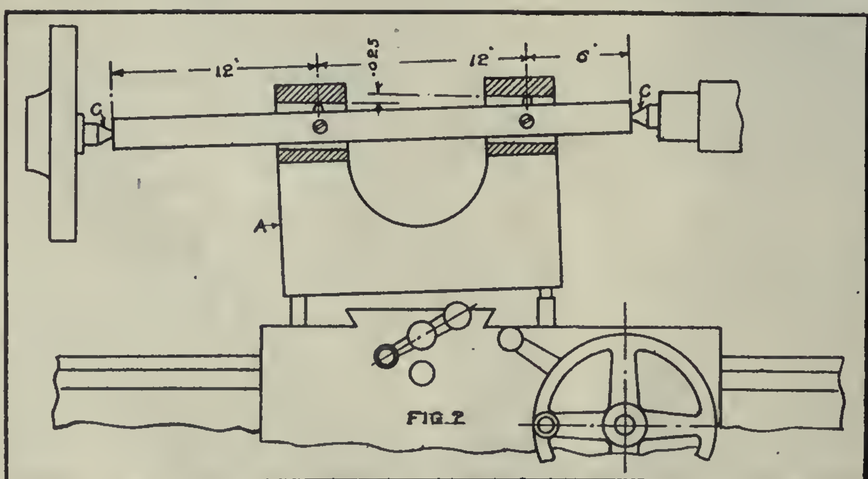
The angle of inclination that the boring bar makes with the lathe shears, or saddle travel, can be found by the formula:—

$$\text{Size of angle} = \frac{\text{Side opposite}}{\text{hypotenuse.}} = \frac{.0625}{30} = .00208, \text{ or } 7' \text{ nearly.}$$

It will be seen by reference to Figs. 3 and 4, that the cutting angle of the tool in relation to the work is continually changing while the bar revolves. The cutting tool always remains at right angles to the axis of the bar, but while it is at right angle to the axis of the holes when in a horizontal position, Fig. 4, it is at an angle of nearly 7 deg. with the axis of the work when in a vertical position, Fig. 3. The hole will, therefore, be slightly smaller vertically than it will be horizontally.

(6)—It might be possible to set the work up by using the boring bar, but, with the centres out of alignment, the work would require to be raised and a strip inserted as shown in Fig. 2, thus bringing the base out of parallel with the saddle travel. In this case, the holes would be parallel with each other, but not with the base, and would be out of line .025 inch.

(7)—By using one cutting tool to bore both holes, a more satisfactory job would result, as the holes would be in line with each other and parallel with the base, but the error would still remain as regards their cylindrical accuracy.



SOLUTION TO BORING PROBLEM.

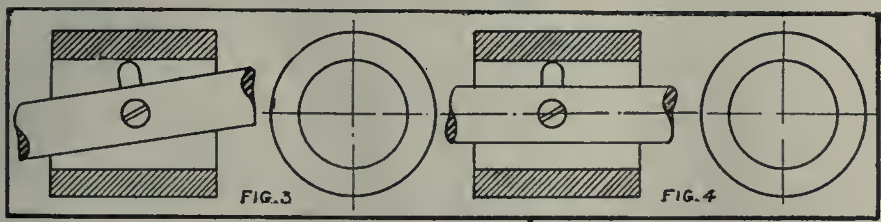
A RIVETING MACHINE.

By S. Baker.

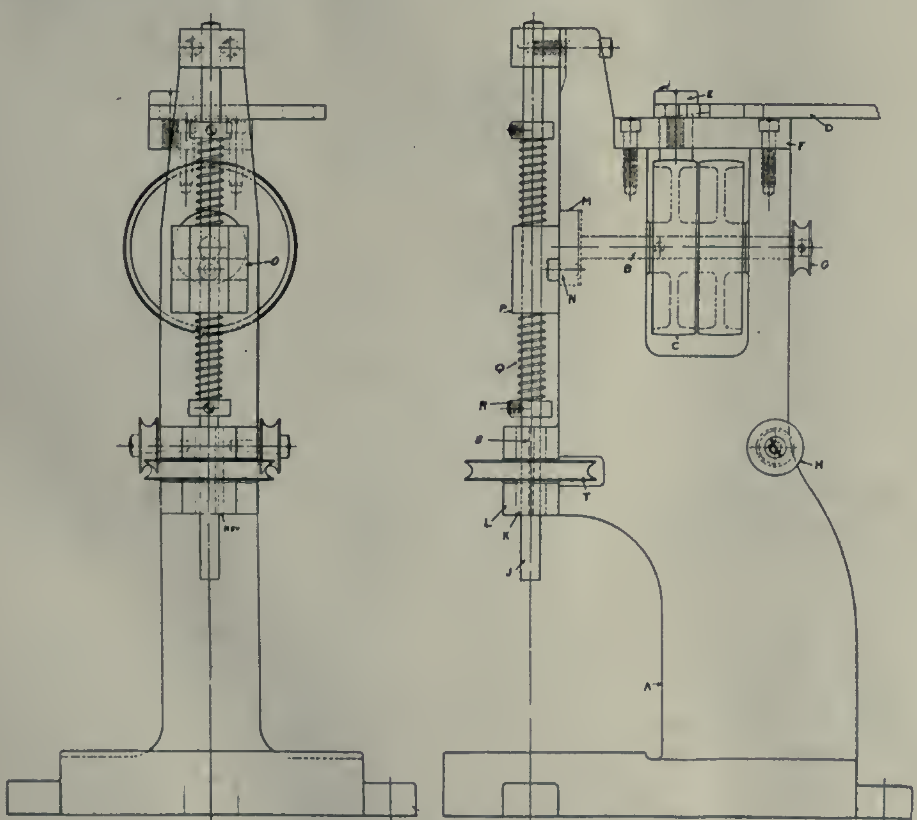
THERE is shown in the accompanying strations, a special riveting machine which was developed in a shop having a great deal of light riveting to do. The machine shown is very rapid in operation, and strikes a light or heavy blow as required, having adjustment provided for this purpose.

The frame of the machine consist of a casting (A) provided with lugs for fastening it to the bench, and through the upright portion of the frame, there extends the shaft (B) which carries the operating elements. To the shaft (B) are fitted loose and tight pulleys (C), over which the flat belt from the countershaft is led. The belt shifter (D) is secured to a plate (F) at the top of the frame, by the pivot screw (E). To rotate the shaft or spindle (J) which carries the hammer (not shown), a pulley (G) is provided on the end of the driving shaft (B), and a round leather belt passes over this pulley to two pulleys (H) on the sides of the frame (A) and to a pulley (I) on the spindle (J). The pulley (I) is placed between lugs (L) which are bushed with hardened bushings (K). As the key (S) is driven and soldered in the spindle, but slides freely in the key way in the pulley (I) the pulley can rotate the spindle while it moves up and down.

The spindle moves up and down as follows: The enlarged end (M) of the shaft (B) has a pin and roller (N) set off centre, which work in the groove (O) in the operating cam (P). As the driving shaft revolves, the pin and roller (N) move the operating cam up and down, and the spindle with it. The operating cam is not secured tightly to the spindle, but between the cam, and two adjustable collars (R), are two compression springs (Q) which are so set as to balance each other, and thus allow the operating cam to move the spindle up and down. The purpose of the springs is that should the work be held too high while the machine is in operation, the spindle would not come far enough down to either break the machine or the work, but after it had come down far enough to engage the work, the springs would simply be compressed . Also, as the work flattens out under the hammer, it is necessary for the latter to descend further each stroke in order to reach it. This arrangement allows the stroke to be self-adjusting, while the work is held in the same position. The machine shown has proven highly satisfactory during several years continuous use.



SOLUTION TO BORING PROBLEM.


A SPECIAL RIVETING MACHINE.

REVIVING A SMALL STORAGE BATTERY.

CHARGE the battery as rapidly as is possible to send current into it without overheating. The resistance being greatly increased by the effect of the sulphate, the cell will become hot when charging. Use a thermometer to test the temperature, and maintain the current at such a value that the temperature of the cell does not exceed 110 deg. F. Continue this charge until the plates begin to gas freely, then reduce the rate of charge to the normal rate and continue this until the plates again begin giving off gas. The rate of the charge should be reduced to half the normal rate, and continued until further gassing again occurs. The cell should then be partly discharged, and the treatment repeated. This cycle of operation may have to be carried on for some time.

SAFEGUARDING OVERHEAD TRANSMISSIONS.

By Fred. A. Barker.

OVERHEAD transmission is not as remote or as free from danger as we oftentimes are led to believe. It is true that many well-regulated factories have rules prohibiting persons from oiling or working on overhead transmission, while it is in motion, but these rules, good as they may be, cannot always be practically enforced. Belts will run off pulleys; and hangers, clutches, collars, couplings and bearings will get out of order. Intelligent care and close inspection are necessary, but unfortunately the practice is more often to look after machinery when it is in motion than when it is still.

Platforms and Walks.

Guarding cannot be absolutely complete on overhead transmission; we, therefore, should endeavor to provide as safe means as possible in getting at the necessary parts. Platforms and oilers' walks should be conveniently placed along shafting wherever possible. These not only allow better opportunities for inspection, but are far safer than some portable means of getting at necessary points. Guard rails and toe boards should be provided on all such platforms.

Pulleys.

Ample space for belts should be allowed between two pulleys, or between pulley and hanger. Belt rests in the form of hooks can well be placed between pulleys or pulley and hanger, and will prevent the belt from wedging or resting on the revolving shaft. If two pulleys are very close together, and no such belt rest can be provided, the space between them can be filled up with a wooden pulley of the size of the regular pulleys, or of a smaller one of the two. Pulleys situated near hangers or other places requiring access can be guarded with stationary guards on the side and supported from overhead. Pulleys can also be webbed on the sides to prevent contact with spokes. Protruding set screws in the hubs of pulleys are a well-known source of danger and can be practically eliminated.

Horizontal and Idle Belts.

Long and high-speed overhead horizontal belts are oftentimes situated directly above persons working or passing underneath them. The breaking of such belts is liable to cause serious accidents. They can be effectively guarded with substantial and well-supported guards placed underneath. Great care, however, should be exercised to design such guards of sufficient strength, otherwise the additional danger is introduced of pulling the guards down with the belt. Guards are often made in the form of a channel in which the lower portion of the belt runs; this forms additional protection in preventing belts from running off pulleys.

Belts when removed from the driving pulley on shafting should never be allowed to hang loosely on the shaft; they may bind and wrap around the shaft with serious results. Idle belts often hang below in a dangerous manner to those nearby.

Shafting, Clutches, Collars, Couplings.

It is not practical, except in rare cases to cover shafting completely; however, points at which frequent access is necessary should be covered with guards of wood sheet metal, wire mesh, or such other special material as may be easily obtainable, depending upon the character of the shop. Protruding parts or clutches, couplings, and collars should be effectively covered or eliminated.

*Reprinted from American Industries, April, 1913.

HANDLING MEN.

SOME executives think that men need disciplining pretty frequently in order to make them do the right thing. In handling men, they neglect the most important factor that determines their actions—the mind. They forget that in order for a man to serve, he must have the desire to serve. Handling men properly should merely be a matter of hiring and firing.

A man should be told what is expected of him, what the policy of the house is, and when he makes mistakes, as all of us do, he should be set right in a friendly way and given another chance. Calling him down harshly does no good. It only engenders ill-feeling towards the house, and kills the spirit of loyalty and co-operation. If he does not fit into your organization after having been given a fair trial, if he does not do his work conscientiously without being watched, he is not worth his salary, and should be fired. Such a man is evidently in the wrong line of work, and it is no real kindness to him for you to retain his services when it is so evident that he needs constant supervision in order to be made to do his work.

The man who needs a boss is not needed by the boss, and the employer's time is too valuable for him to waste it watching men who need watching. Such men will either fit into your organization, or they will not. If they are of the former class, they will be loyal to you, provided you handle them like human beings, and not as rogues. On the other hand, if they belong to the latter class, no amount of cussing and "calling down" will make them loyal, and a man who is not loyal wil not, and cannot give you the best that is in him. Therefore, the only simple, sane, logical and clean-cut thing to do is to fire him.

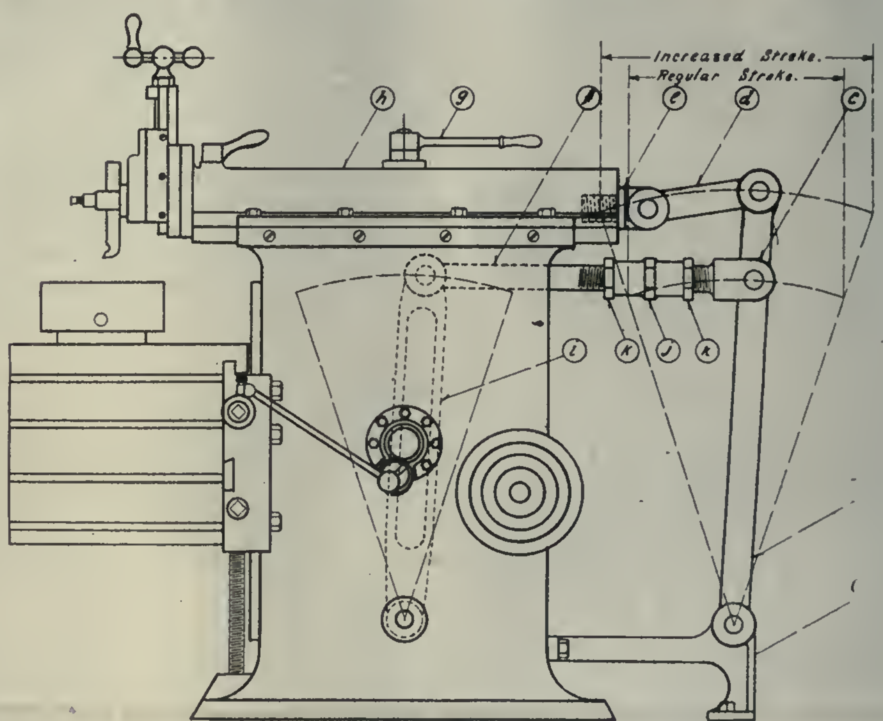
Life is too short and competition too severe, for you to mince matters with the man who cannot fit into your organization. There are too many good men hungry for the opportunity of working for you, and who will not need much supervision, for you to hold on to the men who need a boss.—Can. Indus. Review.

INCREASING THE STROKE OF A SHAPER.

By J. H. R.

SOMETIMES a piece of work is wanted to have a surface o rslot shaped of a length which exceeds the stroke of the shaper by a few inches, and in many cases (especially in jobbing shops) the work must be done at two settings or taken elsewhere. The accompanying sketch shows a method which may prove of service to those who may have such a problem presented.

The bracket (a) is secured to the back of the frame, and also to the floor. The lever (b) is fulcrumed in a fork of the bracket (a) and the upper end connected to the ram by the link (d) and the stud (c). The upper connection of the oscillating lever (i) is disconnected and replaced by the adjusting link (f), (e). The work, having been placed in position as nearly as possible to meet the increased stroke of the shaper, and closer adjustment being made with the adjusting nut (j) is locked in position with the nuts (k) (k).



INCREASING THE STROKE OF A SHAPER.

Care must be taken that the increased stroke does not interfere with the travel of the ram.

F. F. Epenschied, assistant engineer for the Ontario Hydro-Electric Commission, is going to Port Arthur to look over the contract between the Government and the city for supplying power to the former's new elevator. He will also look into Fort William's contract with the Kaministiquia Power Co.

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Vol. X. JULY 3, 1913 No. 1

PRINCIPAL CONTENTS.

THE INDUSTRIAL OUTLOOK.

DOMINION DAY, 1913, will have come and gone, ere this issue, No. 1, Vol. X of Canadian Machinery reaches its subscribers, yet, its epoch marking feature is such as to afford opportunity for an expression of opinion on the near future Canadian industrial outlook . For some months past, a rather pessimistically inclined prominence has been given this subject, and, unfortunately, by men who ought to know better. Tight money, existent and prospective, is the bogey we meet at every turn, and whatever other opinion we may hold, as to the amount of reality contained in the outcry, there is unanimity of opinion that its sponsors are playing the scaremonger part to the utmost limit.

Canada is, without doubt, influenced by domestic and industrial unrest prevailing in other countries, but why in Heaven's name should her public men become paralyzed and panic-stricken, or become opportunists on this account. It would seem to be the rule that the tendency to, or accomplishment of a "Panic" in the United States is the signal for a like condition of things here. A let-up in the demand for iron and steel is sufficient data on which to build a tale, and spread broadcast that "the bottom has fallen out of the market," and the unfortunate thing about the affair is the fact that nine out of every ten people believe the yarn, and never dream of investigating or analyzing the constituent details, even should these exist. Consumption, present and near future, of iron and steel is not such as to materially lessen demand, and in diagnosing the situation, heed should be given to the circumstance that our country's growth and development is of a continuous and permanent nature, and that in keeping up with it, in the matter of mills and factories, record outputs are periodically made. On the other hand, as our factory installations, extensions and enlargements are designed to cover normal periods some time ahead, and when these go into operation and overtake previously "impossible-to-fill" demands, now and then, a point is reached at which capacity more than supplies even normal demand. Such a situation, of course, must and does right itself, and without the aid of professional panic spreaders. The position at the moment sems to be that equipments are now in shape to handle normal outputs, and consumers being aware of this fact have ceased to make reservations of tonnage for any extended period ahead.

The U.S. Tariff Bill is at the present time looming largely in the sphere of industrial enterprise, and its effect on becoming law is more or less uncertain. Withal, we do not look for any abnormal disturbance in the American steel, iron and kindred trades, as conditions, so far as we can gather are on a particularly sound footing, apart from the Tariff feature, and unless those concerned "create" a crisis, should the latter not be to their liking, there is nothing in the industrial outlook to give cause for anxiety.

A contemporary, in close touch with the steel trade, expresses doubts as to skyscraper buildings for office purposes, keeping up the pace of recent years and opines that commercial buildings in the near future will take the form of modern lofts and warehouses. Heavy structural shapes will, therefore, be in less demand, and more highly finished steel materials, such as fire-proof furnishings, hoisting and haulage equipment, conduit and ventilator fittings, etc., will, instead, be required. Reinforced concrete construction would, of course, be the feature of such buildings. The tremendous development which is taking place in all branches of power equipment, steam, electrical and hydraulic, must also be reckoned with in any observations on the industrial outlook, and here there is no sign of slackening up.

Taken all in all, instead of inhaling the atmosphere of pessimism with resignation, as it were, we, in Canada, have every reason to be extreme optimists, and to realize that, while in our growing days, we are perhaps more liable to be influenced by happenings external to us, such a probationary period gives the opportunity to mould the material of which men are made.

SERIES OF ARTICLES ON SCREW CUTTING.

BEGINNING with the July 10 issue of Canadian Machery, a series of Articles on Screw Cutting will appear each week thereafter, and as the writer is an expert mechanic and has been accustomed to instruct students from the practical and easily intelligible standpoint, the attention of apprentices and others who desire to acquire a knowledge of the art from the bottom up, is directed to the forthcoming series.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

	Per Ton.	
Foundry No. 1 and 2, f.o.b., Midland	$19 00	$19 50
Gray Forge, Pittsburg	....	14 65
Lake Superior, charcoal, Chicago	.....	16 25

	Mont'l.	Tor'to.
Canadian f'dry, No. 1..	$21 00	$20 00
Canadian f'dry, No. 2..	20 50	19 50
Middlesboro, No. 3....	23 50	23 50
Summerlee, No. 2	25 00	26 50
Carron, special	25 00	.....
Carron, soft	25 00	.....
Cleveland, No. 1	24 25	25 00
Clarence, No. 3	23 75	24 50
Jarrow	.....	25 50
Glengarnock	.....	26 00
Radnor, charcoal iron.	30 00	34 50
Ferro Nickel pig iron (Soo)	.....	25 00

BILLETS.

	Per Gross Ton.
Bessemer billets, Pittsburgh ..	$26 50
Open hearth billets, Pittsburgh	26 50
Forging billets, Pittsburgh	34 00
Wire rods, Pittsburgh	29 00

FINISHED IRON AND STEEL.

Per pound to large buyers:

	Cents.
Common bar iron, f.o.b., Toronto..	2.10
Steel bars, f.o.b., Toronto........	2.20
Common bar iron, f.o.b., Montreal.	2.15
Steel bars, f.o.b., Montreal........	2.25
Bessemer rails, heavy, at mill....	1.25
Iron bars, Pittsburgh	1.65
Steel bars, Pittsburgh, future	1.40
Tank plates, Pittsburgh, future...	1.45
Beams, Pittsburgh, future	1.45
Angles, Pittsburgh, future	1.45
Steel hoops, Pittsburgh	1.60

Toronto Warehouse f.o.b., Toronto.

	Cents.
Steel bars	2.30
Small shapes	2.45

Warehouse import, freight and duty to pay:

	Cents
Steel bars	1.95
Structural shapes	2.05
Plates	2.05

Freight, Pittsburgh to Toronto:

18 cents carload; 21 cents less carload.

BOILER PLATES.

	Mont'l.	Tor'to.
Plates, ¼ to ½-in., 100 lbs.	$2.35	$2.35
Heads, per 100 lbs.........	2.65	2.95
Tank plates, 3-16 in.	2.60	2.60
Tubes, per 100 ft., 1 inch	9.00	8.50
" " 1¼ in.	9.00	8.50
" " 1½ "	9.00	9.00
" " 1¾ "	9.00	9.00
" " 2 "	8.75	8.75
" " 2½ "	11.50	11.50
" " 3 "	12.00	12.00
" " 3¼ "	13.75	13.75
" " 3½ "	14.50	14.50
" " 4 "	18.00	18.00

BOLTS, NUTS AND SCREWS.

	Per cent.
Stove bolts	80 & 7½
Machine bolts, ⅜ and less	65 & 5
Machine bolts, 7-16.......	57½
Blank bolts	57½
Bolt ends	57½
Machine screws, iron, brass	35 p c.
Nuts, square, all sizes.....	4c per lb off
Nuts, Hexagon, all sizes..	4¼ per lb off
Flat and round head.....	35 per cent.
Fillister head	25 per cent.
Iron rivets	60, 10, -0 off
Wood screws, flathead, bright	85, 10 p c off
Wood screws, flathead, brass	75, 10 p c off
Wood screws, flathead bronze	70, 10 p c off

National-Acme "Milled Products."

Sq. & Hex Head Cap Screws	65 & 10%
Sq. & Hex Head Cay Screws	65 & 10%
Rd. & Fil. Head Cap Screws	45-10-10%
Flat & But. Head Cap Screws	40-10-10%
Finished Nuts up to 1 in. ..	75%
Finished Nuts over 1 in. ..	72%
Semi-Fin. Nuts, up to 1 in...	75%
Semi-Fin. Nuts over 1 in.....	72%
Studs....	65%

Discounts f.o.b., Montreal.

WROUGHT IRON PIPE.

The following are Toronto jobbers' discounts on pipe in effect from April 21, 1913:

Standard	Buttweld Black	Buttweld Gal.	Lapweld Black	Lapweld Gal.
¼ ⅜ in.	62	47	....	....
½ in.	68	58	....	....
¾ to 1½	71½	61½	68½	58½
2 in.	71½	61½	68½	58½
2½ to 4 in. ..	71½	61½	70½	60½
4½ to 6 in.	....	....	71½	61½
7. 8, 10 in.	....	....	66	54

X Strong P. E.

¼, ⅜, ½in. ..	56½	46½	....	....
¾ to 1½ in. ..	67½	57½	....	....
2 to 3 in.	68½	58½	....	....
2½ to 4 in. ..	....	....	65	55
4½ to 6 in. ..	....	....	64	56
7 to 8 in.	....	....	55	45

XX Strong P. E.

½ to 2 in.	43	33	....	....
2½ to 4 in. ..	....	....	43	33

PRICES OF WROUGHT IRON PIPE.

Standard. Nom. Diam.	Standard. Price. per ft.	Extra Strong. Sizes Ins.	Extra Strong. Price per ft.	D. Ex. Strong. Size Ins.	D. Ex. Strong. Price per ft.
⅛in	$ .05½	⅛in	$ .12	½	$ .32
¼in	.06	¼in	.07½	¾	.35
⅜in	.06	⅜in	.07½	1	.37
½in	.08½	½in	.11	1¼	.52½
¾in	.11½	¾in	.15	1½	.65
1 in	.17½	1 in	.22	2	.91
1¼in	.23½	1¼in	.30	2½	1.37
1½in	.27½	1½in	.36½	3	1.86
2 in	.37	2 in	.50½	3½	2.30
2½in	.58½	2½in	.77	4	2.76
3 in	.76½	3 in	1.03	4½	3.26
3½in	.92	3½in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4½in	1.27	4½in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.86	...	.....
7 in	2.38	7 in	3.81	...	.....
8 in	2.50	8 in	4.34	...	.....
8 in	2.88	9 in	4.90	...	.....
9 in	3.45	10 in	5.48	...	.....
10 in	3.20	....	....	...	.....
10 in	3.50	....	....	...	.....
10 in	4.12	....	....	...	.....

IRON PIPE FITTINGS.

Canadian malleable, 40 per cent.; cast iron, 65; standard bushings, 70; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 75; malleable, lipped unions, 65.

COKE AND COAL.

Solvay Foundry Coke	5.95
Connellsville Foundry Coke	5.45
Yough, Steam Lump Coal	3.93
Penn. Steam Lump Coal	3.63
Best Slack	2.95

All net ton f.o.b. Toronto.

OLD MATERIAL.

	Mont'l.	Tor'to.
Copper, light	$10 50	$11 50
Copper, crucible	13 00	14 50
Copper, uncr'bled, heavy	12 00	12 50
Copper wire, uncre'bled	12 00	12 50
No. 1 machine compos'n	10 50	11 50
No. 1 comps'n turnings..	9 50	9 50
No. 1 wrought iron	.....	9 00
Heavy melting steel	.....	8 00
No. 1 machine cast iron	.....	14 00
New brass clippings....	8 50	8 50
No. 1 brass turnings....	7 25	7 80
Heavy lead	3 25	2 90
Tea lead	2 50	2 50
Scrap zinc	3 25	3 50

Dealers' purchasing prices.

METALS.

	Mont'l.	Tor'to.
Lake copper	17.00	14.75
Electrolytic copper	17.00	14.75
Spelter	6.00	5.50
Lead	5.25	5.10
Tin	43.75	43.00
Antimony	10.00	9.75
Aluminum	21.00	22.00

SMOOTH STEEL WIRE.

No. 6-9 gauge, $2.35 base; No. 10 gauge, 6c extra; No. 11 gauge, 12 extra; No. 12 gauge, 20c extra; No. 13 gauge, 30c extra; No. 14 gauge, 40c extra; No. 15 gauge, 55c extra; No. 16 gauge, 70c extra. Add 60c for coppering and $2 for tinning.

Extra net per 100 lb.—Spring wire; bright soft drawn, 15c; charcoal (extra quality), $1.25.

SHEETS.

	Mont'l.	Tor'to.
Sheets, black, No. 28....	$2 85	$3 00
Canada plates, ordinary, 52 sheets	2 80	3 00
Canada plates, all bright.	3 70	4 15
Apollo brand, 10¾ oz. (American)	4 30	4 20
Queen's Head, 28 B.W.G..	4 50	....
Fleur-de-Lis, 28 B.W.G..	4 20	....
Gorbal's Best Best, No. 28	4 45	....
Viking Metal, No. 28....	4 40	....

NAILS AND SPIKES.

Standard steel wire nails, base	....	$2 40
Cut nails	$2 60	2 65
Miscellaneous wire nails..	75 per cent.	
Pressed spikes, ⅝ diam., 100 lbs.	....	2 85

FINE STEEL WIRE.

Discount 25 per cent. List of extras. In 100-lb. lots: No. 17, $5; No. 18, $5.50; No. 19, $6; No. 20, $6.65; No. 21, $7; No. 22, $7.30; No. 23, $7.65; No. 24, $8; No. 25, $9; No. 26, $9.50; No. 27, $10; No. 28, $11; No. 29, $12; No. 30, $13; No. 31, $14; No. 32, $15; No. 33, $16; No. 34, $17. Extras net. Tinned wire, Nos. 17-25, $2; Nos. 26-31, $4; Nos. 30-34, $6. Coppered, 75c; oiling, 10c.

MISCELLANEOUS.

	Cents
Putty, 100 lb drums	$2.70
Red dry lead, 560 lb. casks, per cwt.	6.00
Glue, French medal, per lb	0.10
Tarred slaters' paper, per roll...	0.95
Motor gasoline, single bbls., gal..	0.26
Benzine, per gal.	23½
Pure turpentine	0.60
Linseed oil, raw	0.60
Linseed oil, boiled	0.63
Plaster of Paris, per bbl.	2.10
Plumbers' Oakum, per 100 lbs....	3.25
Pure Manila rope	17

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents.

Montreal, June 28, 1913.—The activity in machine tools and kindred lines has steadily continued and is increasing. A few nice railway orders have been placed recently, and the whole situation seems optimistic and encouraging. Big railways are buying heavily in the States and bridge companies have orders for much structural steel. Thus, all the primary indications are for liveliness everywhere. Two or three of the big supply houses in Montreal report splendid sales during the past week, and they say that more good business is in sight. Locomotive builders are receiving new orders every day, so the report goes, and orders for bar iron naturally go forward as soon as warrant is given of turnover . The C.P.R. have announced a very extensive expansion policy, and on the word of its president, they are to spend over a million dollars at once. This means confidence, and confidence is the watchword for the West .

Pig Iron and Copper.

Low prices still prevail in pig iron, but this, of course, has had the natural result of developing larger buying in certain sections of the industrial field. From the United States, it is reported that most of the activity is in the East, yet some rumors have come forward of sales in the Central West, at extremely low prices. Unsettled feeling exists both with consumers and producers, and it is generally conceded that this state of affairs will continue for some time at least throughout July. Copper is dull, and the demand for refined has been small from domestic consumers . Nominal prices have ruled, but a firmer tone has been noticeable for a day or two. Electrolytic was weak right along. Little business was reported from Europe, and certain industrial conditions in Europe do not seem encouraging in this connection.

Some American reports state that there is a bearish element extant in the older countries, and that 13 cent copper is in sight by November. Local people put no faith in these predictions. Lead is quiet and steady, while refined spelter awakened a little and showed some activity—the first for a long time, August and September offers for spelter being higher considerably. Due to the tumble in tin a week ago, grave reports went all over the world that owing to the heavy decline, the big United States tin mills were to close. This was not confirmed, however, most of these concerns being working to capacity. Still it is well known that new business has not been coming, a state of affairs verified by the independent mills. Our price is cut to $43, and the probabilities are for a still lower market. Nothing is doing in old material, and things remain normal.

Toronto, June 30, 1913.—The Canadian Fairbanks-Morse Co., Ltd., have had a remarkably good month, taken all round. Their machine tool department found things rather quiet, but other lines made up for this. The A. R. Williams Co., whose chief business is done in machine tools, are finding business rather slack just now. The C. P. R. are beginning to place orders for a large number of machine tools, to be used in their shops between Toronto and Vancouver. Some of these orders were received by the A. R. Williams Co. last week. The Dominion Bronze Co., Preston, Ont., have half completed their new plant in Preston, and will place orders for about $20,000 worth of machine tool equipment this week. They will manufacture car fittings principally, the company being associated with the Preston Car and Coach Co.

Pig Iron and Steel.

Better business and lower prices in pig iron were reported from steel centres in the United States last week. The same cannot be said of business on this side. Conditions were just the reverse. Thresher manufacturers are the chief buyers of pig iron and steel, but they are not taking what they contracted for. The implement men anticipated a bumper year in 1913, but so far they have been disappointed. The financial situation prevents them from sending the machinery West, for which they bargained. Deliveries are such now that manufacturers are placing orders with agents for bars, shapes, etc., from the United States Steel Corporation, whose base price is $1.45 at the mill. The entrance of a big Eastern steel concern into the local market has complicated matters somewhat. Their agent is reported to be quoting and cutting steel bar prices, and is in line to get big orders.

Metals.

The collapse in the metal market last week did not resuscitate the local market one bit. Prices remain the same as quoted last week. Business is at a standstill, and is likely to remain so. The price of copper wire was not affected by last week's change.

BRITISH MACHINE TOOL IMPORTS AND EXPORTS.

MACHINE-TOOL imports by Great Britain for May were valued at $233,255, or more than double the total for May, 1912, which reached $114,365. In May, 1911, the imports of machine tools were valued at £21,976.

The export figures were as follows: May, 1911. $305,170; May, 1912, $325,165; May, 1913, $388,335. The value of machine-tool exports for the first five months in each year were:— 1911, $1,452,845; 1912, $1,785,620; 1913, $2,135,905.

Exports of machinery generally during May showed a gratifying advance, the total being $16,279,880.

DIRECT EXPANSION vs. BRINE.

THE direct expansion of a refrigerating liquid or gas through piping directly in the space to be cooled has its advantages, and necessarily it has its disadvantages. The advocates of direct expansion sometimes forget its disadvantages and recommend it for all classes of cold storage and refrigerating work.

Brine circulation has advantages over direct expansion, and it has disadvantages, but generally speaking, the advantages of brine circulation preponderate so greatly, that brine is commonly recommended for general cold storage work. The advocates of brine circulation perhaps carry it a little too far, and sometimes do not favor the use of direct expansion for any purpose.

As between these two extremes, it may be stated that direct expansion is valuable for low temperature work, for quick cooling of warm products, and for the less sensitive classes of cold storage work. Brine circulation for comparatively high temperatures and for a nice control and adjustment of temperature cannot be compared with direct expansion. Therefore, brine circulation has its uses, and direct expansion also has its uses, but brine is best for most purposes.

SCOPE AND EFFICIENCY OF MACINE TOOLS.

THE use of machine tools is often carried into much greater detail in works which are not strictly engineering works, than in actual mechanics' shops. There is a certain unwillingness to get away from the power driving tool proper, and instal a series of machines which have a very restricted scope, though a very large capacity, for work. Many excellent workshops could, however, be improved in profit-earning capacity by a score or more of special machine tools.

The works that only turns out motor cars or bicycles or some special article is, of course, the place where the largest proportion of work can be done by detail machines. In these places, again, two faults are noticeable. The common universal turning lathe is often absent altogether, and there is a tendency to get machines which can be adjusted to a certain variety of work. Once there is work for it, or in practice an average half-day's work for it, the more limited the range of a machine tool, the better it will serve its real purpose. All adjustments and enormously to the size, wearing parts, and floor space of a machine. Very often they also impair its possible accuracy, and rapidity of output.

There are very many branches in which machines could be simplified, improved, and cheapened if the engineers were called upon to design for a much more restricted scope of work. It is quite a common thing to see a row of special lathes with two or three feet of bed and several speeds, and many other "advantages" that are never used. Once depart from the generally useful machine, and the further specialization is carried the better. There is still considerable room for improvement in this matter, and it is for the buyers and users of such machines to determine clearly that they will carry a good principle to its logical conclusion. At the same time, no workshop, however limited, in its range of product, should be without some examples of the lathe—properly so-called.

OVERTIME.

JUST now, when trade is good and most shops are full up with orders, this question demands careful consideration of means to reduce it as much as possible. On one side there is the necessity for output to time, everybody requiring urgent delivery, and in the case of penalty orders, the specified time is the first consideration. A second reason for overtime, especially in the machine shop, is sometimes the lack of capital to invest in new machinery, or in the event of capital being available, the difficulty of seeing a continuance of orders to justify the expense, as the larger the plant the greater the overhead charges during the slack time, the smaller business having to stand a larger percentage of overcharges than when the shop is full of work. Thirdly, comes the question of floorspace, affecting firms which have expanded to the limit of the ground at their disposal, and careful consideration of future orders is required before more ground is obtained.

Overtime on Repair Work.

Fourthly, overtime is always allowable where repairs are concerned. Trade unions recognize this in their rules, and do not restrict their members when overtime is necessary in that department engaged in this class of work. Finally, ment which is behind in output, and may cause other departments to work short time, which not only restricts the works output as a whole, but tends to loss of good men; as the best men will look for another job if they see the possibility of continual short time before them; this final reason only being applicable when reasons two and three hold good.

Effect of Overtime on Profits.

Overtime involves increased rate of cost of manufacture, and consequently less profit. The actual labor cost is higher on account of the men being tired after their day's work and not being able to keep up the same pace. Then, there is the extra pay for overtime rates, besides the cost of light which would not be necessary during the day. If there is sufficient work, the best plan is to work a night shift, as the men are fresher and the payment is slightly less, and there is no time and a-half to pay. It is well to look into the possibility of the possibility of the present orders paying for the installation of new machinery—that is, of course, if capital is available—as, in any case, the overtime rates will be saved, the work got out quicker, and the machinery stands at its full value in the balance sheet for the current year. —Machine Tool Engineer.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Engineering

Sydney, N.S.—No. 2 ore pier of the Dominion Iron and Steel Co. was damaged by fire, June 22nd, the loss exceeding $1,000.

Hamilton, Ont.—Stewart & Wilton are architects for a Foundry and Storage warehouse to be built for the Otis-Fenson Elevator Co.

Fort William, Ont.—The National Boiler Works Co., of Superior, Wis., will erect a boiler and structural manufacturing plant in this city.

Beaverton, Ont.—The Foundry, which was operated here for 30 years by Wm. Smith, has gone into the hands of J. M. & J. O. Reid, of Oshawa.

Fredericton, N.B.—The I. C. R. will locate roundhouse and shops here to handle Canadian Eastern and St. John Valley Railway divisions.

Berlin, Ont.—The Berlin Gasoline Engine Works narrowly escaped destruction on Wednesday, June 25, when fire destroyed the roof of the factory.

Medicine Hat, Alta.—The Medicine Hat Pump and Brass Mfg. Co. will purchase about $50,000 of new equipment for its factory. W. G. Nesbitt, manager.

Sarnia, Ont.—The Doherty Mfg. Co., Ltd., makers of stoves, are constructing an addition to their plant, which should be ready for occupancy by July 10. James Doherty, general manager.

Selkirk, Man.—The Manitoba Rolling Mills, now located at St. Boniface, is making arrangements to move to Selkirk, where it proposes to erect a plant at an ultimate cost of $500,000.

Hanover, Ont.—The Fisher Machinery Co., Ltd., general iron founders and manufacturers of wood working machinery, have recently built a new foundry, which is now in operation.

Preston, Ont.—The Preston Car and Coach Co., Ltd., are building four erecting shops, equipped with air and steam, but without any machinery. Each shop is 60 by 200 ft. long, with three tracks each. This will give floor space to erect 24 steam coaches or 50 street cars. Don. M. Campbell, general manager .

Toronto, Ont.—A. B. Ormsby Co. Ltd., makers of steel window sashes, have nearly completed their new plant at the corner of King and Dufferin Streets, and part will be occupied by the firm in August, and the balance in October. The equipment has not yet been decided upon. C. J. Hale, Toronto manager.

Gananoque, Ont.—Cowan & Britton, makers of nails, hinges and butts, who were reported to be trebling their plant, have been unable to complete their plans to start work this year, but will commence building next spring. R. H. Britton, manager.

St. John, N.B.—T. McAvity & Sons, Ltd., makers of plumbers', steamfitters' and engineers' supplies, expect to complete plans for their new plant by the middle or end of this month, and to proceed at once with actual construction. Some time has been lost closing up details for purchase of site.

Niagara Falls, Ont.—Representatives of the Blystone Manufacturing Co., whose headquarters are at Cambridge Springs, Pa., were here last week looking for a site for a branch factory. The visitors were W. G. Wright, Meadville, Pa., Luther G. Conner, Pa., and D. Blystone, Cambridge Springs, Pa. The company manufactures cement mixing machines.

Saskatoon, Sask.—Work began last week on the plant for Marshall's, Ltd., Gainsborough, Eng., manufacturers of farm machinery. H. E. Lambe, managing director, says the buildings will cost $30,000 to $40,000. The main building will be constructed of brick and steel,

PROBABLE EQUIPMENT REQUIREMENTS

The undernoted firms are now, or likely to be soon in the market for new equipment, etc. For fuller details, reference should be made to the news items:

Machine Tools.

Blystone Mfg. Co., Cambridge Springs, Pa.

A .B. Ormsby Co., Ltd., Toronto, Ont.

Intercolonial Railway, Ottawa, Ont.

Esquimault & Nanaimo Ry., Nanaimo, B.C.

Medicine Hat Pump and Brass Mfg. Co., Medicine Hat, Alta .

School Board, Edmonton, Alta.

National Boiler Works Co., Superior, Wis.

Victor Saw Works, Hamilton, Ont.

Imperial Iron and Steel Corporation, Prince Albert, Sask.

Electrical Equipment.

City Council, Berlin, Ont.
Town Council, Yorkton, Sask.
City Council, Winnipeg, Man.

Water Mains.

Village Council, Hespeler, Ont.

Electric Generators .

Town Council, Merritt, B.C.

Gas Mains.

City Council, Berlin, Ont.
The Consumers Gas Co., Toronto, Ont.

Foundry Supplies.

Otis-Fensom Elevator Co., Toronto, Ont.

School Board, Edmonton, Alta.

Excavating Machines.

Waterworks Commission, Winnipeg, Man.

Refrigerating Machinery.

The Mainland Ice and Cold Storage Co., Vancouver, B.C.

Waterworks Equipment.

Waterworks Commission, Stratford, Ont.

Electric Water Pumps.

Water Commission, Oshawa, Ont.

Heating Systems.

School Board, New Westminster, B.C.

Woodworking Equipment.

John A. McLean, Wingham, Ont.
School Board, Edmonton, Alta.
British Canadian Lumber Corporation, Ltd., Port Renfrew, B.C.

and will be 150 feet by 130 feet. The office building will be a two-storey structure, 50 by 50.

Walkerville, Ont.—F. W. Vollans Co., Ltd., makers of welding machines, who have their plant in operation now, will build a large extension shortly.

Port Colborne, Ont.—The Buffalo Union Furnace Co., manufacturers of pig iron, Buffalo, N.Y., who are building a blast furnace here, expect to begin operations in August.

Prince Albert, Sask.—Work on the plant of the Imperial Iron and Steel Corporation is likely to start at once. James Kreis, consulting engineer, Chicago, has been in Prince Albert in connection with the undertaking.

Hamilton, Ont.—The Massachusetts Saw Works, of Springfield, Mass., will locate a branch factory here, to be known as the Victor Saw Works, Ltd. They will make "Victor" hack saws. The Hamilton plant will be operated as an entirely separate industry. They have leased a two storey building, which will be thoroughly renovated. When running at full capacity the factory will employ about 75 hands.

Electrical

Hamilton, Ont.—The Hydro-Electric department for four months this year shows a surplus of $2,523. The department has 3,859 customers.

Yorkton, Sask.—The town asked the ratepayers on June 20 for permission to spend $140,000 on an extension to the electric plant.

Tweed, Ont.—The municipality has entered into an agreement extending over 10 years with the Tweed Electric Light & Power Co., for the supply of power.

Hamilton, Ont.—Mayor Allan is in favor of building a transformer station on the Beach, through which to pass Toronto and Niagara Power Company's current, in case of trouble on the Hydro lines.

Berlin, Ont.—The City Council have passed by-laws for the expenditure of $85,300 for a trunk sewer, $25,000 for gas extensions, $35,000 for electric extensions, and the rest for local improvements.

Victoria, B.C.—With the completion next month of a dam being built by the British Columbia Electric Co. at Jordan River, in connection with an increase of power development at its plant, 14,000 h.p. will be developed.

Winnipeg, Man.—The terminal power station on Rover Street is to be enlarged; contractors, the Fort Garry Construction Co., Winnipeg. The price is $35,800. New equipment will consist of transformers and switching apparatus.

Medicine Hat, Alta.—It is proposed to electrify the spur, six miles long, running to Ainsley Mine and serving several industrial sites, and arrange with the street railway company to operate motors thereon to do switching for industries.

Toronto, Ont.—The Hydro-Electric Commission will build a transmission line to Morrisburg and Eastern Ontario, 40 miles long, with branches. It will carry 22,000 volts. Power may be obtained from an American company on the St. Lawrence river.

Peterborough, Ont. — The Canadian General Electric Co. will erect two new factory buildings here, costing $7,000 each. There will be one one-story building, 52x127 ft., and one two-story structure, 68x200 ft. The construction will be of brick, concrete foundation.

Toronto, Ont.—Engineer H. H. Couzens of the Toronto Hydro-Electric system is advocating the construction of a steam reserve plant in order to insure an uninterrupted power service to manufacturers in the event of another breakdown in the Hydro transmission system.

If his recommendation is adopted a contemplated cut in rates cannot be made.

Vancouver, B.C.—The Pacific Great Eastern Railway Co., contemplates electrifying their line; and the Bridge River Co., recently incorporated, will develop 200,000 h.p. in the Lliollette district at a cost of $8,000,000, to supply the power. A dam will be built on the Bridge River, and a tunnel, 1¾ miles long, driven through the mountain.

Toronto, Ont.—The Toronto Electric Light Co. have been awarded a permit to build a $12,000 sub-station on the Esplanade in which they will use turbo equipment. R. J. Fleming says nothing about their plans, but it is believed this is a steam reserve for the system, and that expensive equipment will be purchased.

Water Works

Hamilton, Ont.—Owing to the poor showing of the steam pumps during the recent breakdown in the Hydro-Electric system, it is probable the city will call for tenders for new pumps before long.

Hespeler, Ont.—The village Council may erect waterworks with three miles of mains. Clerk, Winfield Brewster.

Orillia, Ont.—The ratepayers have voted against spending $58,000 on extensions to the waterworks system.

Winnipeg, Man. — Excavating machines will be used largely in the construction of the waterworks plant and conduit which will be built to supply the city with water from Shoal Lake.

Sault Ste. Marie, Ont.—The city will have to arrange soon for a civic water supply. It will probably take over the Tagona Water and Light Co. plant and operate it. The lighting system may also be taken over by the city.

Calgary, Alta.—A. W. Ellson Fawkes, waterworks engineer, invites proposals for a 2 ft. 4 in. railway, 2 dinkie engines and 12 cars, for carrying mains along route to source of water supply, 45 miles away.

Wood-Working

Stratford, Ont.—The city is building a $3,000 addition to the waterworks. Chairman, C. E. McIlhargey.

Westville, N.S.—Cameron & Fraser Ltd., are building a boiler house in connection with their new planing mill.

Wingham, Ont.—The John A. Mc Lean sawmills were destroyed by fire on June 25. The plant will be re-built on a larger scale.

Oshawa, Ont.—The water commission are contemplating the installation of electric pumps at the lake in place of the steam pumps, at a cost of $3,000.

Thorold, Ont.—Adams, Farrell and Hardlip, of the Tonawanda Board Co., Tonawanda, N.Y., were here recently looking for a site for a Canadian branch plant.

Municipal

Virden, Man.—The town has voted $25,000 for highway improvement.

Quebec, Que.—The C.P.R. will spend $2,000,000 for the new St. Louis Street wing of the Chateau Frontenac Hotel.

Merritt, B.C.—The town council will purchase a 125 k.w. unit, 3-phase, 60 cycles, 2,300 volts this year, for a power plant addition.

South Vancouver, B.C.—Peter Wylie has been appointed to succeed W. H. Baxter as street superintendent of engineering department, South Vancouver, B.C., at a salary of $225 a month.

Building Notes

East Calgary, Alta.—A building permit for the construction of the P. Burns & Co., packers, plant has been issued. The cost of the buildings will be $200,000. L. R. Burns is in charge of the work.

Toronto, Ont.—Plans are being prepared at Ottawa by the Dominion Government for new Government buildings and Union Passenger Stations. For this, both Front and Yonge Streets will be widened to provide ample approach.

Victoria, B.C.—Plans have been completed for a theatre to be erected here at a cost of about $125,000. The building is to be of steel, brick and concrete, 60 x 120 feet in size. J. J. Donnellen, 319, Pender St. W., Vancouver, B. C., is the architect.

General Industrial

Port Arthur, Ont.—Messrs. Davidson and Smith will build a larger flour mill here than was at first intended.

The London Cold Storage and Warehousing Co., Ltd., has increased its capital stock from $75,000 to $150,000.

Ottawa, Ont.—Fire, June 16, destroyed the main building of the Ohio Brick & Tile Works. Loss, $5,000.

The Thunder Bay Contracting Co., Ltd., Port Arthur Ont., has increased its capital stock from $50,000 to $250,000.

Sherbrooke, Que.—The council has voted in favor of granting aid to the Crown Mfg. Co., of Rock Island, who will build their plant here.

Quebec, Que.—Fire destroyed the Canadian Packing Co.'s plant at Limoilou, June 24th, the loss of $25,000 being covered by insurance.

Lake Megantic, Que.—Joseph Asselin of Beauce Junction, Que. will erect the necessary buildings for a knitting factory here. The Cliche Broom Co. will also build a plant.

Calgary, Alta.—Belley Brothers, Ltd., has been incorporated with a capital stock of $150,000 by Louise de Gonzague Belley, Alfred Belley and others, to build flour mills.

Ottawa, Ont.—Worw will probably be started next month on the harbor improvements and building of grain elevators at Port Nelson, which is to be the terminus of the Hudson Bay Railway. About $5,000,000 will be expended for these improvements. Hon. Frank Cochrane, Minister of Railways and Canals, Ottawa.

Rossland, B.C.—The shaft and tank houses owned by the War Eagle Mine Co. were recently damaged by fire to the extent of $50,000. The structures will be rebuilt.

Edmonton, Alta.—The Staince Co., manufacturers of iron beds, springs, mattresses etc., will build a warehouse and factory, four storeys high. A. G. Wildren, manager.

Vancouver, B.C.—The Alaska Bedding Co. of Winnipeg will shortly establish a branch factory here at a cost of $150,000, employing 100 hands. J. H. Barkhill, Winnipeg, Pres.

MACHINE TOOL EQUIPMENT WANTED.

The School Commissioners of Edmonton, Alta., are in the market for the under-noted machine tool equipment for a new Manual Training School:—

Two milling machines,
One planer,
One cutter grinder,
One universal grinder,
Two wet tool grinders,
One high speed drill,
One radial drill,
One boring mill,
Two speed lathes,
One high speed saw
Two high speed lathes,
Ten 14-inch lathes,
Two shapers.

In addition to the foregoing, a complete foundry outfit, a complete equipment for a wood-working shop, and a complete forge shop installation will be required.

Sir Rodolphe Forget was in Toronto on Thursday last with Mr. Greenshields. They visited the new plant of the International Brick Co., at Cooksville, of which Company the latter is president.

Edmonton, Alta.—The Canadian Oil Co., Ltd., Calgary, has lost its contract for the 1913 supply of oil to the power plant because their samples did not come up to specifications.

St. Catharines, Ont.—The Canadian Flax Mills, Ltd., Toronto, capitalized at $1,000,000, will build a plant here, costing $150,000, employing 150 hands, if given a site and fixed assessment.

Vernon, B.C.—A local company composed of Messrs. Mutric and Mutrie, Neil and Cryderman, H. G. Muller, Billings and Cochrane, C. O'Keefe, E. F. Lloyd, and R. Swift has just bought the patent rights for the manufacture of pressed cement bricks, invented by D. F. Shope, of Portland, Oregon. They may enlarge the present Vernon plant.

Toronto, Ont.—The Consumers' Gas Co. realized $570,000 at a sale of stock on Thursday last. Arthur Hewitt, general manager, says this will be used for further development.

Brampton, Ont.—The ratepayers have voted in favor of lending $20,000 and $15,000 to the Hewetson Shoe Co. and the Hough Lithographic Co. respectively, who will erect factories in Brampton.

Port Renfrew, B.C.—The British Canadian Lumber Corporation, Ltd., has asked shareholders to authorize a bond issue of $3,500,000 to provide for the erection of a mill at Port Renfrew, and for other purposes.

Moose Jaw, Sask.—The Saskatchewan Clay Deposits Co., Ltd., have started manufacturing fire and pressed brick, and may later build a plant for manufacturing a rougher brick and sewer and water pipes.

Moose Jaw, Sask.—The Saskatchewan and Western and the Southern Elevator Companies are adding to the capacity of their buildings here, and it is thought the Imperial Co. will do likewise.

Edmonton, Alta.—Plans are now being prepared by the Fitzhugh Lime & Stone Company for the installation of additional machinery to its plant, which will have the effect of increasing its output of lime from the present daily capacity of 10,000 barrels to 50,000.

Toronto, Ont.—The Government is establishing a brick-making plant at Mimico, being a branch of the Central Prison movement. Hon. W. H. Hanna, Provincial Secretary. The plant will have a capacity of 10,000,000 bricks a year, and will supply bricks for government buildings.

Railways—Bridges

Ottawa, Ont.—Hon. Frank Cochrane has decided to double-truck the Intercolonial Railway line from Moncton to Halifax, N.S.

Toronto, Ont.—The Dominion Government will build a viaduct of concrete and steel, along the water front, and will spend $6,000,000 or $7,000,000 as its share of the expense.

Vancouver, B.C.—Sir Richard McBride announces that the Pacific great Eastern Railway will extend into Alaska through from Vancouver. Present plans of the line carry it north only as far as Fort George, 450 miles from Vancouver.

Cobalt, Ont.—Chairman Englehart, of the T. and N. O. Railway, says a suitable route for extending the Elk Lake branch beyond Gowganda cannot be found.

Morrisburg, Ont.—The Williamsburg township has voted against granting right-of-way and a bonus of $8,000 to the Ottawa and St. Lawrence Electric Railway Co.

Ottawa, Ont.—Three bridges are to be erected on the Canada Eastern branch of the Intercolonial Railway, this summer across the Nashwaak River above Marysville, at Covered Bridge, and at Nelson Hollow.

Stratford, Ont.—A municipally-owned street railway system with hydro-electric power, is being contemplated by the Council. The franchise of the Stratford Street Railway Co., which was to have been financed by the C. N. R. interests, will probably be cancelled.

Victoria, B.C.—The Esquimault and Nanaimo Railway is spending $100,000 on machine shops, round houses and terminals at Russell station. The round house, which has ten stalls, is nearly complete. The machine shop will measure 145 by 72 ft. E. R. Doe has the building contract, and R. A. Bainbridge is the divisional engineer.

Contracts Awarded

Sydney, N.S.—The C. N. R. has just placed a large order for rails with the Dominion Steel Corporation.

Hamilton, Ont.—Richard Pope has the contract for erecting a theatre costing $20,000 for E. J. Guest.

Yorkton, Sask.—Ritchie & Watters have been awarded the contract for the erection of the power station. The contract price is $36,557.

Ottawa, Ont.—The Government has awarded the contract for the new Customs House on Sussex Street to the Simcoe Construction Co., of Simcoe, for $995,000.

St. John, N.B.—The Provincial Government has awarded the firm of James McVey & Son, St. Stephen, the contract for the substructure of a bridge at Reversing Falls.

Moose Jaw, Sask.—The city has awarded the firm of Willans & Robertson the contract for the installation of a new 1,500 k.w. turbo generator for the power house.

South Vancouver, B.C.—The British Columbia Equipment Co. has been awarded a contract for the construction of a 750,000 gallon steel standpipe at $30,000 by the City Council.

Montreal, Que.—The Board of Control has granted a contract for widening the city aqueduct to the Cook Construction Co., of Sudbury, Ont., the lowest tenderer. Their price is $2,322,552.

Regina, Sask.—Parsons Construction and Engineering Co. are erecting an incinerator building for the city, and the Decarie Incinerator Co., Minneapolis, Minn., will supply the incinerator plant.

Ottawa, Ont.—A contract has been awarded to the Peter Lyall Construction Co., of Montreal, for improvements to Rideau Hall. The figure is $125,000, and the main work consists of a new entrance.

Fredericton, B.C. — The Concrete Construction Co., Ltd., of Ottawa, has been awarded a contract for painting the steel bridges in New Brunswick by the Provincial Department of Public Works at a cost of $25,000.

Edmonton, Alta.—The city has awarded the contract for building the filtration plant to the New York Continental Jewell Co. for $117,000, to be completed April 15, 1914. The contract for sewage pumps went to W. H. Allen, Son & Co., Bedford, England, for $1,960.

Strassburg, Sask.—The British Canadian Engineering Supply Co., of Winnipeg, has been awarded the contract for supplying the town with one 50 h.p. Ruston-Proctor gas producer and engine, and the Canadian General Electric Co., the contract for 37½ k.v.a. generator, exciter, etc.

Newcastle, N.B.—Hon. John Morrissy, Provincial Minister of Public Works, has awarded the contract for the steel superstructure of the new bridge at Newcastle to the Dominion Bridge Co., of Montreal, the contract price being about $100,000. The contract for the Clain bridge in King's County was awarded to A. E. Smye, of Alma, Albert County, his tender being in the vicinity of $2,500.

Tenders

Ottawa, Ont.—Tenders were called last week for the Toronto Harbor works, to cost $6,000,000. Plans are in view, for similar works at Hamilton.

Toronto, Ont.—Tenders will be received by the Board of Control up to July 8th for a pumping station at the foot of Woodbine Avenue. H. C. Hocken, Mayor.

New Westminster, B.C.—The School Board will call tenders for a commercial school, chemical laboratory, and for heating systems.

On July 17 the tenders for the first section of the Welland Canal will be in, and those for other sections will be called in a month or so.

South Edmonton, Alta.—Tenders have been called for the erection of the new C. N. R. station of brick and stone, which, together with the iron covered shed, will cost $40,000.

Victoria, B.C.—The Engineering staff of the Public Works department is working on the plans for piers and harbor work at Victoria, B.C. The plans will be ready this month and tenders will be called.

Ottawa, Ont.—Tenders, addressed to J. K. Jones, Asst. Deputy Minister of Railways and Canals, Ottawa, and marked "Tender for Steel Pontoon Gate Lifter, Trent Canal," will be received until 16 o'clock on Tuesday, July 29th, 1913. Plans, specifications and form of contract to be entered into can be seen on or after this date at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Superintending Engineer, Trent Canal, Peterborough, Ont.

Refrigeration

Vancouver, B.C.—The Mainland Ice & Cold Storage Co. is having plans prepared for a new cold storage plant, four storeys, of mill construction. Estimated cost, $150,000. Gould & Wood, Vancouver, B.C., architects.

Marine

The Canadian Towing and Wrecking Co., Ltd., has increased its capital stock from $100,000 to $200,000.

Hamilton, Ont.—The Ottawa Contractors, Ltd., have begun work on the extension of the revetment wall. Work will not be completed until a year next autumn.

Victoria, B.C.—The Government will establish a ferry service between Woodwards Landing and Ladner, and will make an early start on road improvement.

Quebec, Que.—In a few days the government will award contracts for the largest dry dock in America at St. Joseph de Levis, and for deepening the St. Charles River.

Walkerville, Ont.—A new steel passenger ferry boat Essex was launched at the Toledo Shipbuilding Co's. plant June 25, for the Detroit & Walkerville Ferry Co. It will be delivered Aug 1. and will cost $100,000 and will carry 600 people.

Selkirk, Man.—The Selkirk, a passenger steamer for the Lievre River Navigation Co., was launched on Wednesday, June 18, at the Landing. It will cost $9,000, and is being built by R. J. Morril, Collingwood, the Doty Marine Engine and Boiler Co., Ltd., supplying the boiler and engine.

New Incorporations

Kipawa Power Co., Ltd., incorporated at Ottawa, capital $1,000,000, to generate electricity at Toronto.

Radio Electric Co., of Canada, Ltd., incorporated at Ottawa, capital $200,000, to manufacture telephones and telegraph apparatus at Montreal.

Transcontinental Power Corporation, Ltd., incorporated at Ottawa, capital $10,000, to distribute electrical energy or any other power or force in Toronto.

London Asbestos and Supply Co., Ltd,. incorporated at Toronto, capital $25,000, to buy and sell asbestos at London. Incorporators: John Putherbough, Thos. L. Partridge, etc., London.

Resilent Spring Wheel Co., Ltd., incorporated at Toronto, capital, $40,000; offices at Toronto. Incorporators: Geo. H. Sedgewick, Austin G. Ross, etc., Toronto.

Amalgamated Nickel-Copper Mining Co., Ltd., incorporated at Toronto, capital $1,000,000, to acquire mineral lands and deposits at Ottawa. Incorporators: William C. Perkins, Harold F. Meech, etc., Ottawa.

Armstrong Cork Co.—Notice of the incorporation of the Armstrong Cork Co., Ltd., appears in The Canada Gazette. The company is capitalize dat $100,000, with headquarters at Toronto. Among the incorporators are W. A. J. Case, solicitor, James B. Taylor and George C. Loveys, accountants, all of Toronto.

Trade Gossip

The Erindale Power Co.and The Interurban Electric Co. are at law over $93,000 which the former claims from the latter for power alleged to have been supplied.

The Truro Foundry and Machine Co., Ltd., Truro, N.S., has been placed in the hands of a receiver. It is believed the plant will be taken over by a new company, shortly to be formed.

Convention of Boiler Manufacturers.—The twenty-fifth annual convention of the American Boiler Manufacturers' Association of the United States and Canada will be held in Cleveland, Ohio, on September 2, 3, 4, and 5, 1913.

The International Harvester Co., Hamilton, Ont., announces that it will close its plant this summer for not less than a month. It usually closes down for two weeks for stock-taking. The demand from the West has not been as large as usual.

The American Club, 19 Wellington Street W., Toronto, which was recently formed, has bought the Union Bank Building at the above address. Most of the machinery men of Toronto who are Americans, or who have lived in the United States over four and a half years, are members.

Goulds Pump Co., of Canada.—The business of the Goulds Pump Co., of Canada, Ltd., is now being carried on under the name of the Storey Pump and Equipment Co., Ltd. The present offices at Montreal and Toronto, and the personnel of the Company have not undergone any change.

Canada's U.S. Trade.—During April, 1913, the exports of Canada to the United States amounted in value to $8,763,013, which is $497,334 less than those of April, 1912. Her imports from the United States for the month were $37,416,217, exceeding the corresponding figures of last year by $6,416,998.

The Canadian Abrasive Wheels Co., Ltd., who have purchased a site in Dundas, Ont., for a plant, costing a minimum of $20,000, is reported to be the new name for the Canadian Corundum and Wheel Co., Barton Street, Hamilton, who have been contemplating an extension for some time, but found it inconvenient to do so in Hamilton.

Oppose tax on machinery—Under the revised municipal code of the Province of Quebec, the taxing of machinery is permissible. The Boards of Trades in session at Farnham, Que. passed a resolution last week expressing belief that such a tax would be detrimental to the manufacturing interests of the Province. It was recommended that this Article be struck out of the municipal code.

John Bertram & Sons, Co., Ltd., Dundas, Ont., have increased their equipment by the addition of an 84-inch Pond reversing motor planer, a 96-inch motor-driven boring mill, and two Cincinnati milling machines. The plant has been equipped with twenty-six motors, made necessary by the change from 66 to 25 cycle current. Last week a Colliau cupola, manufactured by Byram & Co., Detroit, 48 in. diameter, was substituted for 36-inch cupola.

The Perolin Co. of Canada, Ltd., was recently incorporated in this conntry as sole distributors in Canada of Perolin, a mechanical treatment for boiler scale, pitting and corrosion. It has been used in Europe for eighteen years under the name of S. R. Sampf-Keffel-Meschung, and Old Country engineers in Canada will remember it by that name. When injected into the boiler Perolin forces its way through the cracks in the scale and breaks it down; the Perolin remains and prevents further encrustation. Headquarters are in the Standard Bank Building, Toronto, and some well known Toronto business men are on the directorate.

The International Engineering Works, Ltd., Amherst, N.S., have recently sold return tubular boilers to the following companies:—C. W. Church, Falmouth, N.S., 50 h.p.; Amherst Pianos, Ltd., Amherst, N.S., 110 h.p.; R. H. Williams, Regina, Sask., three 110 h.p.; Grant Bros., Calgary, Alta., 65 h.p. Robb portable boilers have also been recently sold to A. C. Higgs, Nappan, N.S.; C. O. Black, Oxford, N.S., and McGillivray Creek Coal & Coke Co., Calgary, Alta. The Canadian Westinghouse Co., Hamilton, Ont., have recently purchased three engines from the International Engineering Works, Ltd., for direct-connection to alternating current generators for the Canadian Pacific Railway, and the Canadian Explosives, Ltd., Montreal, Que., are to install two 14 in. by 18 in. Robb Corliss engines direct-connected to 125 K.V.A. electric generators.

The Chapman Engine and Mfg. Co., Dundas, Ont., have begun the manufacture of small size gasoline engines and well drilling machinery. Operations were commenced two years ago in a disused cotton factory, which has been converted into an up-to-date engineering plant, with first-class machine tool and other equipment. Up till last summer they purchased the castings for their engines outside, but have now a foundry with a 56 inch Calumet cupola, made in Harvey, Ill. Moulding is done both on bench and floor, and eventually moulding machines will be employed. Besides the machine shop and foundry, there is a pattern shop, core room, with the latest core oven, cleaner room, forge, testing, assembling and painting department. Ample room is allowed for expansion, which should take place before long, as developments are being planned. About a hundred men are employed. Steam is supplied by a boiler made by Goldie & McCulloch, Galt, Ont.

Personal

J. M. Reid, who has purchased the Beaverton foundry, was formerly with the Paxton Tate Co., Port Perry.

George Butcher, superintendent of Darling Bros., Ltd., Ottawa Street, Montreal, has gone on a brief holiday.

John Ankers has been appointed by the New Westminster, B.C., City Council to the position of waterworks superintendent. He was for twenty years pipe line inspector for the city.

V. I. Smart, of the department of railway engineering, McGill University, Montreal, has resigned to accept the position of general manager of the General Railway Signal Co. of Canada.

J. G. Seyfried, structional engineer, Grand Trunk Railway, Montreal, has been appointed engineer of the bridge department, Canada Foundry Co. Ltd. Mr. Seyfried will have his headquarters at the Toronto plant.

District Engineer McLachlin, who is located at Victoria, B. C. will be put in charge of the work of surveying Esquimalt Harbor by the Dominion Department of Public Works, with a view to location of the new $3,000,000 dry dock.

Gasoline Engines.—We have received from Canadian Engines, Ltd., Dunnville, Ont., a copy of their 1913 catalog decriptive of their "Monarch" line of Gasoline Engines. These are made in small sizes, and are well adapted for use around the farm, also for driving pumps and generators. The catalog is well illustrated and the reading matter very instructive.

Prof. Howe, of the Chair of Engineering, Dalhousie University, has been appointed engineer for the Grain Commission in charge of the construction of all terminal elevators to be erected in the West. Mr. Howe is a native of Waltham, Mass., and a graduate of Massachusetts .Institute .of. Technology, and has been Professor of Engineering at Dalhousie for five years.

Collingwood B. Brown has been appointed to the position of Chief Engineer of the Government railways in Canada. Since graduation in civil engineering in Cornell fourteen years ago, Mr. Brown has been in the employ of the C.P.R., filling various engineering positions from rodman to principal assistant engineer, a post to which he was appointed two years ago, and which he now resigns to become head of the Government railway's engineering department. He will take up his residence at Moncton on the 1st of July.

Peter Donaldson, Glasgow, Scotland, 54 years of age, a bachelor, and chief partner in the firm of James Watson & Co., who recently failed, was found drowned in the Clyde, according to a cablegram from London June 24. He was also president and managing director of the Dayton Coal & Iron Co. operating two blast furnaces at Dayton, Tenn. The liabilities of his company are stated to be about $1,995,000, while the assets may not amount to more than $650,000. The tragedy and disaster are the result of efforts to corner the pig iron market, the Watson Co., having attempted to carry a bigger load than they were able.

D. A. Street, Ottawa, was elected president of the Canadian Electrical Association for the coming year at their annual convention at Toronto on Friday, June 27. The following other officers were elected:—first vice-president, A. L. Mudge, Toronto; second vice-president, B. H. McDougall, Toronto; third vice-president, W. Maclachlan, Trenton; honorary secretary, T. S. Young, Toronto; secretary-treasurer, H. T. Martin, Toronto; managing committee, A. A. Dion, Ottawa; J. S. Goulds, Smiths Falls; F. G. Clarke, Toronto; L. Clark, Hamilton; R. S. McDunnough, Three Rivers; H. G. Matthews, Quebec; E. L. Milliken, Sydney; W. L. Bird, Fort William; W. S. Robertson, Toronto; A. G. Dunlop, Peterboro'; R. M. Wilson, Montreal; R. H. Sperling, Vancouver; R. J. Smith, Perth; W. G. Angus, Hamilton.

Obituary

John Hall, for 40 years a patternmaker in the employ of The Burrow, Stewart & Milne Co., stove makers, Hamilton, Ont. died on Tuesday, June 24.

John W. Ritchie, formerly of Orillia, Ont., chief operator of the Mississippi River Power Distributing Co., St. Louis, Mo., was electrocuted on June 28th, at the company's plant.

Catalogues

The University of Illinois have issued bulletin No. 66 on "The Properties of Saturated and Superheated Ammonia

Practical Data Relative to the Erection of Shafting

By Joseph Horner

Shafting for the transmission of power through belts, ropes, gears, etc., forms a prominent feature of our factories and industrial plants generally. The necessity of giving its installation more than ordinary attention, and the points to be observed when doing so, are fully dealt with by the writer in the accompanying article.

THE friction of shafting is very considerable even under the most favorable conditions, while, under bad conditions, it is excessive. The chief cause of the latter may be summed up in a phrase—lack of alignment. Three things are contributory to this—shafts bent and crooked, bad setting and fixing of bearings, and the effects of settlements and wear and tear. The results of each of these are much worse with rigid and plain bearings than with swivel, ball and roller bearings, but they occur in greater or less degree with all types. Departure from absolute accuracy should be avoided, because the effects are liable to be cumulative. One element of error may act in a fashion which will add to and increase that of another kind instead of neutralizing it. The shaft and bearings may be out of truth in opposite directions, and one bearing may be out in the opposite direction to the adjacent bearings. Accuracy, therefore, in each element is essential, if the truth of the whole system is to be maintained.

Difficulties of Erection.

What renders the alignment of shafting so difficult to secure in the first place is that there is no very tangible datum line from which to operate. There is nothing corresponding, for example, to the surface of a lining off table, or the bed of a machine, or an angle bracket or machine centres. Everything must be primarily referred to the spirit level and plumb line or water trough, and all tests must be made by these alone. The very refined methods of the machinist have no scope here, although the ultimate results should be nearly as

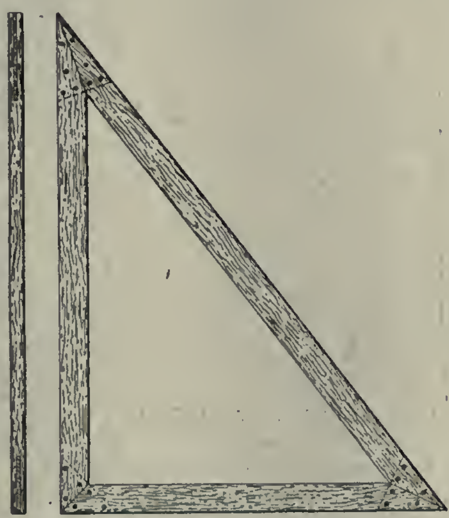


FIG. 2. LARGE WOODEN SQUARE.

exact as those obtained by the machinist. The work is nearly identical with that of the erection of large structures, such as fixed cranes, overhead travelling and gantry cranes, conveying systems—work which is done by men who are fitters or millwrights and specialists in erection where plumb lines, levels, straightedges, parallel strips, straining lines, packings and their adjustments, are the principal aids.

Weak Shafts.

Bent and crooked shafts have also been a fruitful source of friction in shafting, much more so in the old days of wrought iron shafting than at the present time when the employment of steel is universal. The sight of weak, wobbling shafts was a common one some years ago. They were weak in themselves and inadequately supported by their bearings. At that time it was usual to turn only the journal ends of the shafts, together with such short sections as had to receive pulleys or gears. The principal portion of the length being rough, as rolled, tended to develop wobble and eccentricity, especially as the shafts were nearly always too weak for their work. Moreover, they became in time overloaded by further additions of pulleys and gears, which they were never originally intended to carry, with the inevitable results of sag and wobble. From such bad practice, steel shafting and more enlightened methods have come to the aid of millwright. Stiffer and stronger, although lighter, steel shafts do the work of the heavier wrought iron ones, with reduction of friction. They are supplied either turned or rolled.

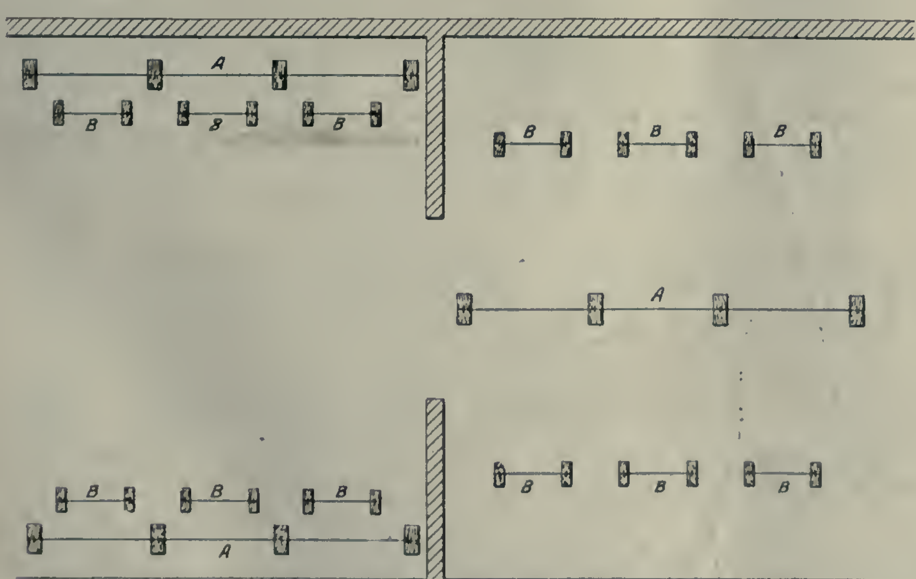


FIG. 1. ALTERNATIVE ARRANGEMENTS OF SHAFTING.

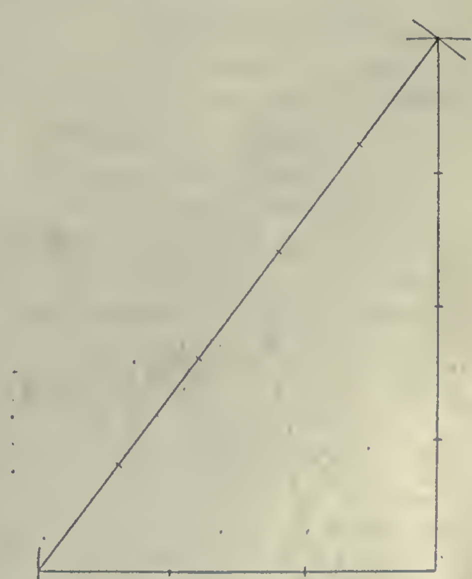


FIG. 3. ERECTING A RIGHT ANGLE.

Inaccurate Fixing of Bearings.

Bad setting and fixing of bearings may double the friction, and so produce injurious heating and cutting of journals, thereby necessitating more frequent and copious lubrication than if bearings were properly aligned. Excellent results may be obtained with the old style of rigid bearings, if they are aligned correctly, and bad results follow, on the other hand, with adjustable bearings poorly set. The latter, however, are preferable, because they accommodate themselves to slight inaccuracies, and mask and neutralize the effects of indifferent workmanship.

The Influence of Wear.

The effects of wear and tear are more serious with rigid bearings than with adjustable ones, for, although bearings are set in absolute alignment, they may get out of truth in a year or two, in consequence of slight movements in beams, walls, foundations, which movements may increase with more or less irregularity. Corrections and readjustments will, therefore, be more imperative if the bearings are of rigid type than if they are self-adjusting. The risks of settlement are not very serious in the basement of a well-constructed building, or in the beams of a substantially built one-storey shop, but they are always present in the storeyed shops, where the beams which carry the floors have also to carry the shaft bearings. The floors sink and the beams become distorted. This is especially noticeable in new shops, if the shafting is erected before the machines are laid down. Then subsequent corrections are inevitable.

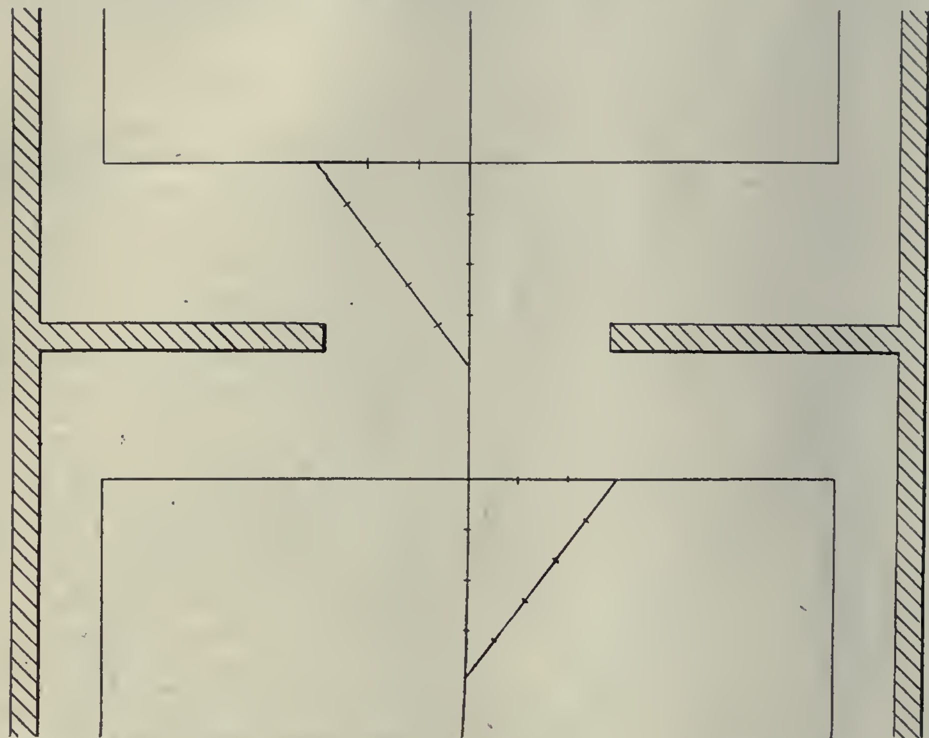


FIG. 4. CARRYING LINES FROM ONE SHOP INTO ANOTHER.

The Lay-out of Shafting.

With regard to the disposition of line shafting, this must be governed by the features embodied in the design of the building. In a narrow shop it is usual to fix the line shaft bearings to one wall. In large modern shops, having bays separated only by columns, the bearings are attached to these columns, and the belting drives from each side, or the hanger form of bearing may be used and bolted to the under sides of the joists above, which are part of the roof principals, or which sometimes support an upper floor. The methods by which the bearings are attached to walls, columns or joists vary greatly, and the fact that they are designed to suit all conceivable conditions, explains the differences in the shapes and means employed.

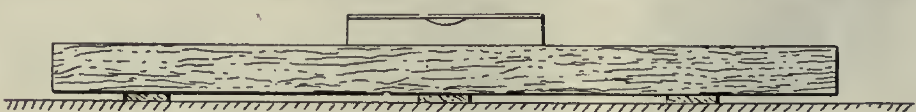


FIG. 5. LEVELLING DATUM BLOCKS.

Methods of Erection.

There are two ways of erecting shafting; one, which is by far the better, consists in working from the floor, while the other involves working from the beams above. Such beams, however, are often absent. The first can always be adopted in a new shop, but if the floor is already occupied with machines, the second plan may be accepted, although it is preferable, with the modern style of roof, to attach the bearings to columns. Frequently, in smaller shops, timber beams are bolted along the roof principals solely to receive the counter-shaft bearings.

Erecting From the Floor.

In working from the floor, the positions of the shafts to be erected are laid down upon it, beginning with the main line shaft or shafts. From these are marked the secondary lines and the coutershafts. In Fig. 1 two common alternative dispositions of shafts are outlined in diagram in plan. In that to the left, the line shafts (A) (A) occupy the sides of the shop, driving to the countershafts (B) (B), farther away from the walls. In the other to the right, one line shaft (A) runs down the centre, and drives to the counters (B) (B), right and left. The latter is not always practicable in wide shops, but is more economical in those of moderate width.

Laying Down Centre Lines.

When lines of shafting occur at right angles, a square is hardly correct enough to use, unless a very large wooden one, measuring several feet along the sides, is made and kept for the purpose, like that shown in Fig. 2. It is made of narrow strips of wood abutted at the corners and tongued, with the pieces fitted

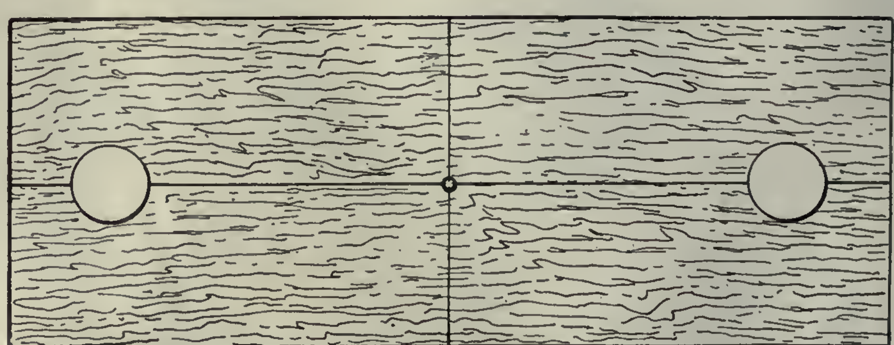


FIG. 6. TEMPLET FOR MARKING BOLT HOLES.

FIG. 7. ADJUSTING BEARINGS BY SPIRIT LEVEL AND PARALLEL STRAIGHT EDGE.

FIG. 8. PLUMBING BY CENTRE OF SHAFT.

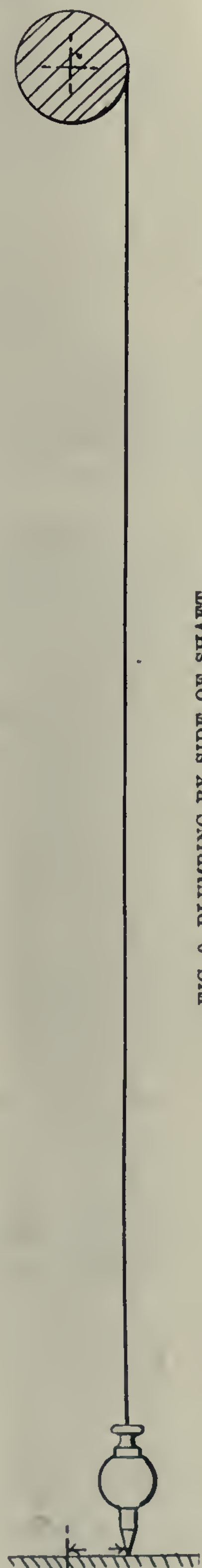


FIG. 9. PLUMBING BY SIDE OF SHAFT.

and glued into a saw kerf, and all secured with glue and screws. Such a square, apart from rough usage, maintains its accuracy permanently, yet the geometrical relation, of (3), (4), (5) Fig. 3, is better. Feet or yards can be used according to the lengths of the shafting, and a trammel employed to lay down the dimensions, or a light rod marked off in the lengths required. The lengths (3) and (4) will be at right angles with each other.

This is plain sailing, when the work lies on the floor of one shop, but when shafting has to pass through walls into adjacent shops, one has to be careful, since measurement from walls is not considered permissible. A correct method, then, is to use the doorway to carry a datum or centre line through from one shop into the next, Fig. 4, extending either along the whole length of each, or for as much of the length as may happen to be required. From it the centre line or lines of shafting can be set off parallel on the floor. When parallel lines of shafting are required on opposite sides of a wall, as in Fig. 4, additional care must be exercised. If the length of one shop is enough to be a guide, a long fine line can be safely stretched to coincide with that line laid down, and extended into the one adjacent. If not, the most suitable method to adopt is to raise a vertical (B) from the centre line (A), Fig. 4, already existing, and from that to raise another vertical (C), which will then be in line with the first. The relation (3), (4), (5) will be used.

Centre lines are snapped with a fine chalked cord used in the same way that wood workers do. It is held taut by a man at each end, while another at the centre lifts it a few inches perfectly plumb, and lets go sharply. A fine chalked line will thus be transferred to the floor. As many lines are snapped as there are lines of shafting, all being set down by careful measurement parallel with or at right angles with each other. At the end of each line a small nail is driven in to be a permanent record in case the lines should become obliterated.

Levelling the Basis Line.

These datum lines correspond with the intended positions of the various shafts in plan, which shafts, eight or ten feet above, will now have to be plumbed over them. The horizontal truth of the shafts has to be set in the first place by measurement and then checked by a spirit level. To accomplish this a level base is required on the floor. A convenient method is to nail strips across on the centre lines, Fig. 1, corresponding with the positions over which the bearings will be plumbed, and reduce the surfaces of some or of all with a plane until a parallel straight edge carrying a spirit level, and moved across from one to the other, Fig. 5, shows that they are level throughout. At the intersection of the centre line of the shaft with the centre of each bearing, a small nail is driven in as a permanent witness. From these nails as centres the bearings are fixed, the methods of doing which vary with the designs and methods of attachment.

Instead of fastening datum pieces on the floor to obtain a truly horizontal base, a long narrow water trough has been used, although a more compact method still is the hydrostatic level of the Webster Manufacturing Co. In this, two vertical tubes are connected with a length of hose fitted with stop cocks. The height of the water in the tubes, set any distance apart, gives a true level. The level can be graduated in inches and parts of an inch within a range of 3½ inches.

Approximate Settings.

From this point of departure, bearings may be fixed as plummer blocks to beams overhead, or as hangdown bearings from beams, or as wall brackets of various shapes. Different means are necessary in each, and these will be considered in turn. Also, the work is naturally divided between two stages, the first being more or less approximate, the second corrective and exact.

Fixing Plummer Blocks on Beams.

The first thing to do is to get a centre on the underside of the beam plumb over the corresponding centre on the floor. This is easier said than done, with a bob swaying very slowly to rest. A boy below must steady the bob while the man makes adjustments on the ladder. The cord may be held in the fingers, and from it a centre be marked on the underside of the beam to correspond with that below. A templet has to be prepared corresponding with the foot of the bearing, or of its separate sole plate if such is used, the bearing or sole plate, as the case may be, having to be bolted on top of the beam. The templet, Fig. 6, has a centre bored in it and two bolt holes, or four, to correspond with the bolt holes in the foot or in the sole plate. The templet is laid against the lower face of the beam, and centred through its centre hole to the hole already plumbed up from below. The bolt holes are then marked through it, and bored with an auger as perpendicularly as possible. Instead, however, of proceeding in this way, it will be rather easier to pass the plumb line through the centre hole in the templet, lay the latter on the lower face of the beam, clamp it tightly, and adjust it by tapping the edges until its centre is right. The bolt holes can then be marked through, the centre marked by the intersection of the two centre lines on the templet, transferred to the beam and scribed.

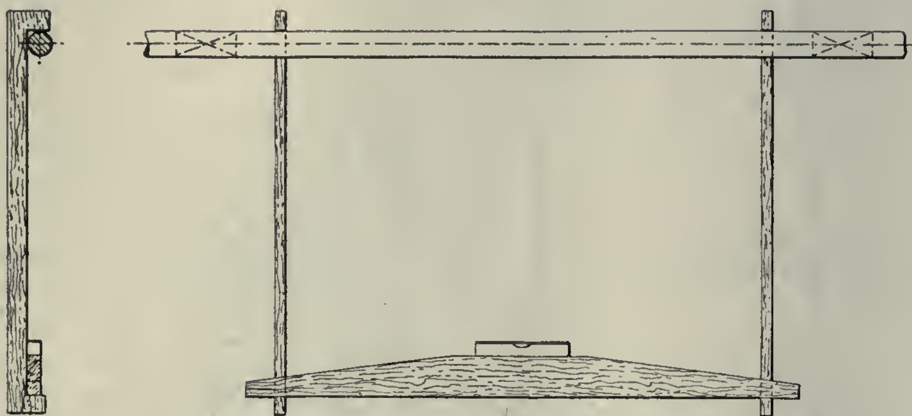


FIG. 10. ALIGNING SHAFTING WITH STRAIGHT EDGE, SPIRIT LEVEL AND SUSPENDED RODS.

By means of the bolt holes, the bearings will be loosely set and attached in place on the top of the beam, but not finally tightened up until they are tested carefully for plumb. Usually, ⅜-in. of play across the line of the shafting is allowed in the slot holes of plummer block feet or sole plates to permit of adjustment, and to compensate for the rough character of the holes bored. If the bearing fits on a sole plate, the former usually alone has adjustments on the plate, and if bolted directly to the beam, its foot has slot holes.

Packing Up.

Bearings of ordinary form have no provision for vertical adjustment. These, therefore, or their sole plates, usually require packing pieces to level them up to compensate for inequalities in the beams. They, also, are fitted before the bolts are finally tightened. The approximate thickness of packings required can be obtained by sighting along the series of beams with a surveyor's level, and getting an assistant to mark the height or thickness of each packing on a strip of wood laid on the beam. Pieces will then be planed to those thicknesses, and laid under the sole plates or the plummer blocks, after which the exact levelling will be done directly from the shafting, which is now inserted. This may be done before the final lateral adjustments, or subsequently, preferably, the latter.

Checking for Level.

Before laying the shafting in its bearings, much subsequent adjustment may be avoided by laying a parallel straightedge in the bottom of the open bearings and trying a spirit level on the straightedge, Fig. 7. The straightedge can be shifted from bearing to bearing along the whole line, and the thicknesses of the packings corrected. When each contiguous pair of bearings is levelled thus, one from the other through the series, the whole must be in alignment. The shafting can then be laid in.

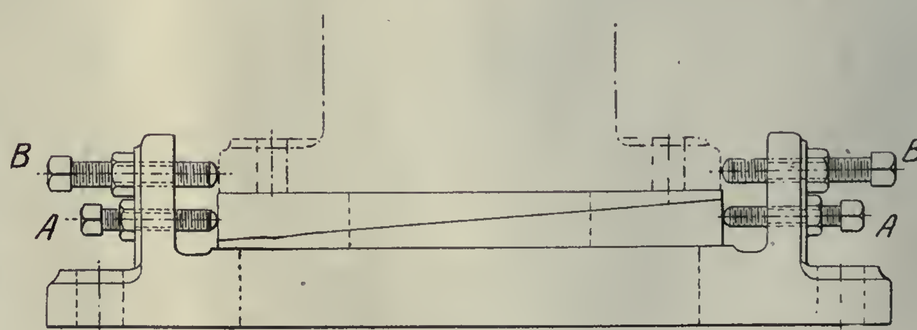


FIG. 11. WEDGE-ADJUSTING SOLE PLATES.

Use of the Straining Line.

The straining line is of fine hard brass or copper wire. Owing to its deflection, it cannot be used with accuracy for horizontal adjustments, the straightedge and spirit level being much more reliable, preceded, if desirable, by measurement up from the datum blocks on the floor by means of a rod. If, however, it is strained by a weight at one or at both ends, the wire passing over pulleys, most of the sag can be pulled out of it and allowance made for the slight residium by sighting along. It may also be supported in each bearing, on a strip of wood bridging the bearing, flush with the joint, and then sighted along. When adjustable bearings are used, this is accurate enough for the preliminary adjustments, leaving the final ones to be made with the spirit level, after the insertion of the shafting.

The straining line of wire is, however, more properly employed for making lateral alignments, being usually strained along the edges of the open bearings before the shafts are inserted. It may, however, be strained along the centres, but in that case the bearings must be bridged with strips of wood on which the centre lines will be scribed.

Making Lateral Adjustments.

Lateral adjustments are made or checked also, by the centre lines on the floor by plumbing down from the shaft itself. This may be done by looping a cord round the shaft so that the cord hangs from the centre with the plumb bob on the end, Fig. 8, or the line may be hung over the shaft at one side, in which case measurement must be taken from the bob to the centre line, Fig. 9, the distance being, of course, one-half of the shaft diameter. The bearings are tapped laterally in one direction or the other until these adjustments are made correctly, after which the bolts may be tightened up provisionally.

There are short cuts available in cases where a large number of bearings are in question, as occurs in long lines of shafting. In such circumstances the intermediate bearings can be adjusted laterally by means of a cord strained along the whole length to form a datum for the lateral alignment. A cord is dropped from each end of the shaft and the datum line strained along just in contact with these. From each bearing, a line is dropped and adjustments are made until each line makes contact with the horizontal cord.

Horizontal Adjustments.

To effect the final adjustments of shafting horizontally, a spirit level placed directly on it would not give accurate results. A better method is to lay a long parallel straightedge and place the spirit level on that so as to check its departure from truth and make adjustments by the thickness of the packings, taking a few shavings off those where the bearings stand highest. This involves getting up and down ladders; a neater way, therefore, is to hang hooked rods contiguous to adjacent bearings, Fig 10, lay a parallel straightedge on the lower hooks, and test with a level laid on the straightedge, and so on through the series.

Alternative to the wood packings previously mentioned, the use of folding wedges, Fig. 11, affords a more convenient mode of adjustment. The wedge pieces are sufficiently wide to reach across the width of the plummer block base, and are slotted through from each end for the bolts. The lower screws, (A), four in number, effect the adjustments of the two strips, and the upper ones (B,) of which there are two, adjust the lateral position of the plummer block.

NEW C. P. R. YARDS.

It is expected that the new yards of the C. P. R. at North Transcona, east of Winnipeg, will be in full operation by September 15. About 45 miles of tracks in the yards are being used, and, on the day mentioned, an additional 47 miles will be ready for use. The cut-off connecting the west part of Winnipeg with the yard has been completed with the exception of the bridge, the piers for which are being put in. The completion of this structure will enable the bringing of the grain traffic direct into the yard instead of hauling it through the city. An agreement has been reached between the C. P. R. and the city of Winnipeg to remove the present subway at Main Street, and to build a new one considerably wider and six feet higher, the work to be done within two years.

To face a cast-iron pulley with leather, apply acetic acid to the face of the pulley with a brush, which will roughen it by rusting, and when dry, apply a cement made of 1 lb. fish glue and ½ lb. of common glue, melted in a mixture of alcohol and water. The leather should then be placed on the pulley and dried under pressure.

Recent Judicial Decisions

Hamilton, Ont.—Mr. Justice Middleton gave judgment at Osgoode Hall, Toronto, June 27, in the action brought by a contractor named Dick against the Standard Underground Company, of Hamilton, to recover payment for work done under a contract, which he did not complete. Defendants denied liability and set up a counter-claim for the amount they paid for the completion of the work. His Lordship decided in favor of the defendants, and ordered Dick to pay them $15,701, without prejudice to any further claims they might have against him. The conduct of the contractor, said his Lordship, precluded his recovering damages for delay, but if on appeal, he was held to be entitled to such damages, they were fixed at $1,000.

Victoria, B. C.—The Westholm Lumber Co. has instituted an action against the City of Victoria, the Water Commissioners of Victoria, Water Commissioner J. L. Raymur, J. L. Beckwith, Mayor of Victoria in 1911; Wynn Meredith, Consulting Engineer of the Corporation; Alderman George A. Anderson, George Okeli, of the Finance Committee, and Boyd Ehle, Superintending Engineer of the Sooke Lake Waterworks Scheme. In a statement of claims filed in the Supreme Court registry by the company, the charge is made that representations made by the defendants were untrue in substance and in fact. The suit is for a declaration that the Sooke Lake Waterworks Contract be declared null and void. The contract was awarded to the Westholme Lumber Co. by the City of Victoria last December. It is alleged that defendants represented that they had acquired all the rights-of-way, the finance and the powers to enable them to construct the system, that they had made examination of the route and prepared estimates of cost and quantities, and that they had a complete plan of the works showing them to be located on the northwest side of the River Sooke, and that the grades for the system had all been established. The plaintiffs allege that this was misrepresentation. The Westholme Co. ask in addition to the cancellation of the contract that they be awarded payment for work already done on the scheme and also damages. Mr. Justice Murphy ordered that particulars of the alleged misrepresentations and dates of publication, etc., of the articles complained of be furnished, or else the clauses be struck out.

BALANCING TURBO-ALTERNATORS.

According to the Electrician, in United States factories, practically all turbo-alternators are balanced by a cut-and-dry process. The turbine is first assembled on the test floor, and connected to the steam and exhaust mains and to the oil and water systems of the plant. As the machine is driven under its own power, the test men determine which end of the machine is the worst by placing the forehead against the casing at different places. A weight is then inserted into one of the tapped holes provided in the rotor, and the machine is run up to speed and the result of the experiment is noted. If the vibrations are less violent but still noticeable, another and heavier weight may be inserted in the same hole. If the first attempt produces more violent vibrations, the weight is removed, and placed in some other part of the rotor.

Each tester generally has his own "follow-up scheme" of placing the successive weights. The process is continued until both ends of the turbine are free from vibration at the rated speed. When the generator is attached to the shaft, this process is repeated and weights are placed upon the ends of the rotor at various points on the circumference until all bearings and the casings of both the turbine and the generator are free from vibration as far as can be detected by placing the forehead against them. Many factories balance the rotors of their generators dynamically before they are assembled in the machine. Special apparatus fitted with delicate balancing mechanism is required for this work.

"MADE IN CANADA" TRAIN.

The "Made in Canada" train, which started out from Montreal over the C. P. R., and which was entirely built at the Angus Shops at Montreal, has covered ten thousand miles through Western Canada, making calls at all points along the line to Calgary and Wetaskiwin, and down the Macklin-Outlook branch to Regina, and over portions of other railways. Many thousands of visitors took advantage of inspecting the well-fitted up cars, demonstrative of the manufactures of Canada. On Dominion Day it commenced its return journey to Winnipeg.

K. B. McDonald, who for the past two years has been factory manager of the Russell Motor Car Co. at West Toronto, has resigned.

Cutting Worm Gears for Motor Car Power Transmission*

By F. W. Lanchester

Compared with other forms of gearing, on the score of efficiency, modern worm gear seems able to hold its own. Samples of the Lanchester Gear taken from stock showed efficiencies varying from 95 to 97 per cent., as tested and certified by the National Physical Laboratory.

POWER-TRANSMITTING worm gear for motor-cars, to comply with two main conditions, must give an efficiency comparable, if not equal or superior, to the efficiency of the alternative types of gear—bevel or chain, and must be of approximately similar weight and size to a bevel gear of equal horse-power capacity. It was unnecessary to mention silence as a third condition, since this was the direction in which worm gear was notoriously beyond reproach, while on the score of efficiency, modern worm gear was well able to hold its own.

Samples of Lanchester worm gear taken from stock at the Daimler Works showed efficiencies varying from 95 to 97 per cent., as tested and certified by the National Physical Laboratory. On the score of weight and compactness, this gear did not compare unfavorably with bevel gear, and the size and weight of a rear axle for a given duty was approximately the same for both types. Apart from consideration of load carried, the efficiency of worm gear or screw gear was a function of the angle made by the teeth. Neglecting journal and thrust friction, or including such bearing friction in the total reckoning of tooth friction, the best efficiency was obtained when the worm tooth angle was 45 deg. minus half the effective angle of friction.

The maximum load that could be transmitted by any gear pair depended mainly on the type of worm or screw gear employed and on what tooth pressure the gear would stand without expelling the lubricant from between the engaged surfaces. In some cases, the limit was not the oil film, but rather the hardness of the materials of which worm and wheel were constructed.

Torque and Other Factors.

In considering the design of worm gear for a motor-car, whether a pleasure or a commercial vehicle, the conclusion was that the main factor in determining the size of the worm gear was the torque on the driving axle. Now, if it were proposed to propel any given vehicle with an engine of specified horsepower, that might be obtained by large cylinders and slow revolution speed, or smaller cylinders with higher revolution speed. It was evident, therefore, that a ready means was required to compare the power transmission capacity of worm gears of given centres, under conditions of constant driven torque and variable speed reduction ratio. It might be pointed out that, in certain cases, especially where noise was unimportant, a gear might be used between the motor and worm shafts in place of the direct drive, in order to accommodate a worm standard that might otherwise be unsuitable.

Selection of a Suitable Gear.

The selection of a suitable gear depended on four factors—the weight of the vehicle and the diameter of the driving wheels on the one hand, and the centres of the gears and the torque curve on the other. It was thus quite a simple matter to specify the proportions of the worm gear required for any given duty. In the design of different types of gearing, whether worm or spur, the important factors differed considerably according to the type employed, and even according to the ratios required. Thus, in spur gearing the strength of the teeth was a very important factor; while in power transmitting worm gears, the strength of the teeth need rarely, if ever, be considered, for designs which fulfilled the other necessary conditions were usually found to possess ample strength.

Again, in spur gearing, the pitch diameters, or, in the case of involute gears, the rolling circles, required to be selected exactly in the ratio of the transmission, and no departure was permissible. In worm or screw gear, on the other hand, no such rigid conditions existed, and the angle of the gear teeth might be selected to accommodate any diameters required. For given gear centres the gear ratio was a function of two variables—the size ratio of the blanks and the tooth angle—whereas in the ordinary spur gear the one variable alone determined the gear ratio.

Force Transmitted by Teeth.

It had been the author's custom, for many years, to express the force transmitted by the teeth as a pressure per square inch on the projected area of the worm wheel teeth. On this basis, worm gear cut according to his system would carry easily one ton per sq. in., and was good for an overload of two or three times that amount—in fact, a load of two tons per sq. in. might be regarded as a safe load, inasmuch as the gears would run satisfactorily with such a load for an indefinite period. Taking a car and passengers weighing two tons gross on a 1 in 12 gradient, there was roughly a tractive resistance with allowances for groad resistance of 0.2 of a ton, which represented on the worm teeth 0.8 ton on a projected area of approximately half an inch, or 1.6 ton to the inch. The gear would work quite satisfactorily and would show no signs of distress under these conditions.

Efficiency Feature.

The most important direction in which it was desirable to test worm gear was to determine its efficiency under various conditions of load and speed. Where the efficiency of any piece of mechanism was high, such tests, to be of any real service, must be carried out with a very high degree of accuracy. Thus, where an efficiency of 97 per cent. or thereabouts (as in a well-designed worm transmission) was obtained, it was useless to employ methods having an error of 1 per cent., more or less, for such an error might be regarded legitimately as a 33 per cent. error in the measurement of the power wasted in transmission.

If the tests were to afford anything of a nature useful to the engineer in the improvement of his methods of generating, or to enlighten him with reference to the best conditions under which worm gear was to be employed, he must be able to detect with certainty variations in the amount of power lost of a far less magnitude. It might be said that unless the loss of power could be determined to within about 5 per cent., the method was unsatisfactory. Thus, taking 96 per cent. as a good average worm gear efficiency, the loss of power was 4 per cent. and the determination should be within an error of one-fifth of 1 per cent. Such was the degree of accuracy obtained as certified by the director of the National Physical Laboratory by the new Daimler-Lanchester testing machine.

In principle, the new machine was an instrument for the direct comparative measurements of two torques acting about axis at right angles, or more generally about axis making any angle with each other, but unsuited to cases where the torque axis approached the parallel.

Many facts of considerable importance, both to the designer and to the

*From a paper read before the Institution of Automobile Engineers.

user, had been elucidated by recent tests with the new method. It appeared that at the best the parallel worm could scarcely reach the efficiencies shown to be regular with the Lanchester gear. At the worst the efficiency of the parallel gear fell 3 or 4 per cent. lower, particularly in the case of heavy loads, and it was claimed that the oil film began to break down in the case of the parallel worm at loads which the Lanchester gear sustained without loss of efficiency. The loss of efficiency at reduced speeds was far less than had been previously supposed; at the lowest useful motor-car speeds it rarely fell much below 94 per cent., and it was quite exceptional to record efficiencies below 93 per cent.

Great variations in efficiency were due to differences in the lubricant employed. In general, mineral oils were much inferior to animal or vegetable oils. The viscosity of the oil was little or no guide in the selection of an oil for the purpose in question. Again, the efficiency might be lowered by the presence of too much lubricant in the gear-box. The best efficiencies were obtained with a certain perceptible tooth clearance, and the best clearance in an ordinary motor-car gear appeared to be about 1-64in.

PROTECTION OF BOILERS.

THE Cumberland Electrical Process for the Protection of Boilers has been introduced into the United States with a view to preventing the corrosion of boilers. It consists of the use of one or more electrodes installed in the boiler, and connected to the positive terminal of a direct-current supply, the boiler being connected to the negative terminal, and the water forming the electrolyte. It is stated that only enough voltage is required to overcome the resistance through the water, and any counter electromotive force due to the difference of potential of the metals of the boiler.

A report issued by the United States Navy Department states that some experiments were carried out on a small fire-tube boiler having brass tubes, with a steel shell, in which five polished steel plates were placed—one on the crown sheet, one across the top row of brass tubes, one across the tubes about the middle of the nest of tubes, one on the bottom of the shell-plate under the furnace, and one at the smoke-pipe end. The boiler being filled with water, steam was raised to 190 lbs. per sq. in. pressure, and kept up for five days, after which the boiler was examined.

There were no signs of hydrogen gas, and the electrode placed in the boiler was found to be considerably corroded. The brass tubes showed no corrosion, nor was there corrosion on the test pieces. Underneath the cathode, and on the tubes and shell, a deposit of black iron dust was found, which could easily be washed off. Old scale had also been cracked off the crown sheet and shell in places. The scale on the brass tubes was also cracked off in places, and could be easily washed away. The iron electrode in the water was, it is stated, very badly corroded.

CAPACITY OF ROUND TANKS.

THE accompanying table, taken from the "Motor Boat," giving the capacity of round tanks, will possibly be found useful in many departments of manufacturing and industrial plants:

Diameter in Inches.	Gallons per Inch.	Weight in lbs. per inch. Petrol. Sp. G. 73	Refined Paraffin. .796	Scotch Paraffin. ,81	Crude Oil. .85	Lubricating oil .895	Fuel oil. .93	Water. 1.0
6	.0969	.7074	.7713	.7849	.8236	.8672	.9011	.969
6½	.1134	.8278	.9028	.9186	.964	1.015	1.055	1.134
7	.1304	.9520	1.038	1.056	1,108	1.167	1.213	1.304
7½	.1514	1.105	1.205	1.226	1.288	1.355	1.408	1.514
8	.1719	1,255	1.368	1.393	1.461	1.539	1.599	1.719
8½	.1943	1.418	1.547	1.574	1.651	1.739	1.807	1.943
9	.2180	1.591	1.735	1.766	1.853	1.951	2.027	2.18
9½	.2425	1.77	1.930	1.964	2.061	2,170	2.255	2.425
10	.2690	1.964	2.149	2.186	2.294	2.416	2.510	2.69
10½	.2968	2.166	2.363	2.404	2.523	2.656	2.76	2.968
11	.3253	2.375	2.589	2.635	2.765	2.912	3.026	3.253
11½	.3557	2.597	2.831	2.881	3.023	3.183	3.307	3.557
12	.3876	2.829	3.085	3.14	3,294	3.469	3.605	3.876
13	.4546	3.319	3.619	3.683	3.864	4.069	4.228	4.546
14	.5270	3.847	4.195	4.269	4.48	4.717	4.901	5.270
15	.6057	4.422	4.821	4.906	5.148	5.421	5.633	6.057
16	.6887	5.027	5.482	5.579	5.854	6,164	6.405	6,887
17	.7772	5.673	6.187	6.296	6,606	6.956	7.228	7.772
18	.8722	6.367	6.942	7.064	7.414	7.806	8.112	8.722
19	.9712	7.09	7.73	7.866	8.256	8.692	9.032	9.712
20	1.076	7.855	8.566	8.716	9.146	9.632	10.07	10.76
21	1.187	8.665	9.45	9.616	10.09	10.62	11.04	11.87
22	1.302	9.504	10.36	10.55	11.07	11.65	12.11	13.02
23	1.423	10.39	11.33	11.53	12.10	12.74	13.23	14.23
24	1.550	11.32	12.34	12.56	13.18	13.87	14.42	15.50

LOCOMOTIVE SUPERHEATER DESIGN.

HITHERTO, it has been the almost invariable practice to design a locomotive superheater entirely without reference to the construction of the smoke-box, except, perhaps, as regards capacity. According to the Railway Times, however, Mr. S. M. Vauclain, of the Baldwin Locomotive Works, Philadelphia, proposes to construct the smoke-box in a special manner to adapt it for receiving and carrying the header of the superheater. The circular smoke-box is cut away at the top, so that its walls enclose only about 250 degrees. The uncompleted portion provides an opening sufficiently large to permit of the superheater header being passed through it from above, and this header is so constructed that it combines, with itself, a casting shell, which, when riveted to the smoke-box shell, complete the circular form thereof. The header casting also receives the joints of outside steam pipes—presumably for use with large Mallet articulated engines—so that all the connections and steam passages are combined therewith, the steam inlet pipe at the top, and the two delivery pipes from the superheated steam compartments of the header towards either side.

SARNIA WATERWORKS.

IN connection with the recent ceremony of turning the first sod for considerable extensions to the waterworks of the town of Sarnia, Ont., it is interesting to note that the Waterworks Commission have finally decided to install steam turbine-driven pumps, after having spent considerable time in investigating all other types, including the vertical high duty type of pumping engine.

The available speed of the pump is 1,500 r.p.m., this being fixed by the fact that at some future time it may be required to connect the pump to an electric motor to operate on the Hydro-Electric 25-cycle supply. Herringbone gears are to be used to connect the pumps to steam turbines operating at 3,600 r.p.m. By using this speed for the steam turbine, about 20 per cent. less fuel will be consumed than if the turbines were run at the same speed as the pumps. "Herringbone" type gears have been successfully employed for powers sufficiently large to drive steamships, are entirely enclosed in a cast iron casing, and are practically noiseless. There are two similar units to be installed.

The pumps are of the well-known Mather & Platt single stage turbine type, each capable of delivering 3,000 Imperial gallons per minute against 200 feet head, and the complete contract has been placed in the hands of the Canadian Allis-Chalmers, Ltd. The various units will be manufactured at their Montreal works.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

INSPECTOR BENCH GAUGE.

By A. L. Monrad.

ONE might naturally think nothing of importance could be added to gauging nowadays, but, from things seen, and experiments made in the past few years many things have been learned which, no doubt, may interest some readers looking for information in this direction. While bench gauges are not new, as to design, they are really very much neglected. They are great time savers, if properly made, not only as regards accuracy but also as regards manipulation of the work, where thousands of pieces must be handled daily.

Referring to the assembled sketch (A), after the gun receiver has been machined on the inside and the holes drilled and reamed on both ends, the inside bottom cut is gauged to proper depth in relation to the holes on each end, as the gun bolt slides to and fro in the bottom cut, and in parallel lines with the holes. An allowance of two thousands of an inch is the limit allowed for a sliding fit, and any slight variation will show very distinctly on the multiple lever (B). The gray iron plate (C) is planed all over to 1 in. thickness, 6 in. wide, and 12 in. long.

The right hand block (D), of machinery steel and finished all over, is held in position on the cast iron plate, from underneath, with two fillister screws and two dowel pins. A hardened, ground and lapped plug (E) is driven into the block (D) in the proper location with the centre line of the plug, and a 7/8 in. slot is milled on the opposite side of the block (D). A hardened and lapped machinery steel piece (F) fits this groove and is held securely with a fillister screw (G) to the block. The plug (E) and the locating piece (F) are lined up, so that when the receiver (A) is in position on the gauge, the inside cut of the receiver is absolutely parallel, both ways, to the cast iron plate.

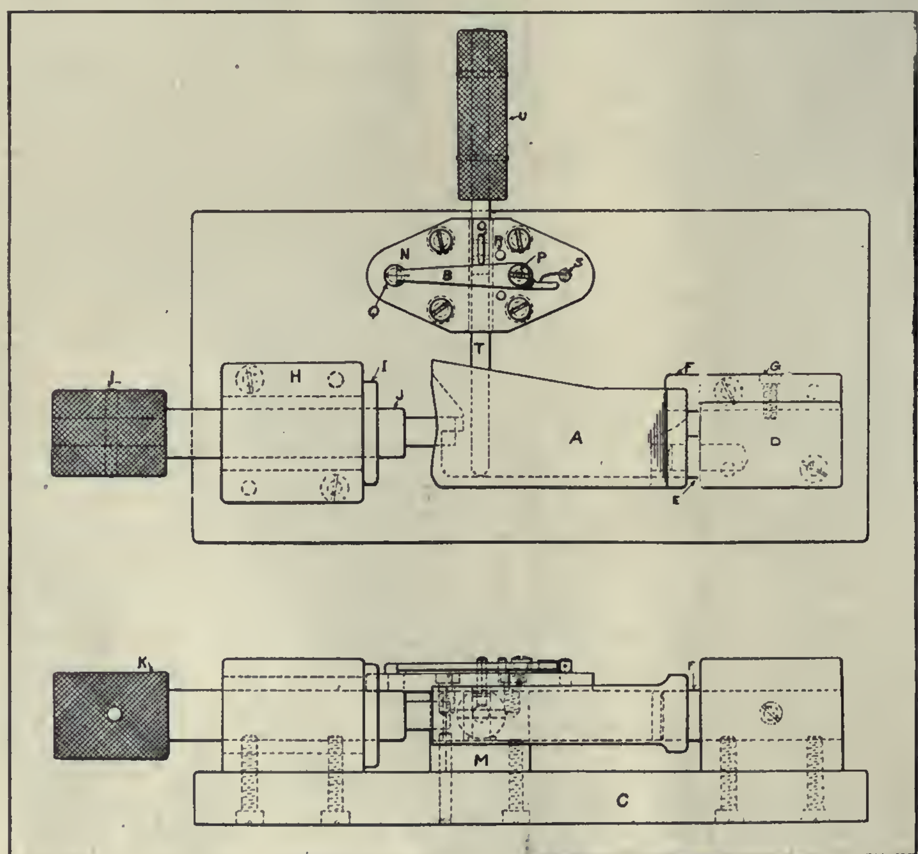
On the left hand side of the plate another machinery steel block (H) is held in position with two fillister screws and two dowel pins, and in its centre is bored a 1 3/8 in. hole, to receive as a driving fit, the hardened, ground and lapped tool-steel bushing (I). In this bushing is fitted a hardened, ground and lapped tool-steel plug (J) with a turning fit in the receiver (A) hole. On the other end of the plug is fitted a knurled handle (K) held in position with a pin (L). When this block is properly located, it should register parallel with the other block, also parallel with the cast iron plate as regards the inside cut in the receiver.

Multiple Mechanism.

The multiple mechanism consists of a hardened machinery block (M) held on the cast iron plate by two screws and two dowel pins from underneath the plate. In the centre of this block is milled a 5-16 in. clot, 7/8 in. deep or the same depth as the width of the cut in the receiver. In the bottom of this slot is cut a T groove, to enable the sides in the slot to be lapped thoroughly clean and parallel in a lapping machine or a hand-miller, because this sliding gauge has to fit exactly the same as a hardened, ground and lapped plug gauge. Should there be the least play on the sides, it will show immediately on the multiple lever.

Lapping Feature.

Perhaps some readers are interested in this lapping proposition, therefore, to that end I will endeavor to explain it in detail. Procure a cast iron disk 1/4 in. x 3 in. with a 1/2 in. or 1 in. hole to fit the arbor of a hand miller, and take a side tool and place it in the hand milling machine vise. Turn the vise over on an angle of about 15 degs., with the side tool on the centre line of the cast iron disk. Face off both sides and relieve it so as to give the disk about 1/8 in. surface, bearing on the sides. This is done in order to have the disk run absolutely true on the arbor. Now replace the side tool with the block (M) and adjust the vise so that the disk bears all the way on the side. Mix thoroughly, fine emery and sperm oil together with a few drops of kerosine oil. Run the hand miller on the first speed and move the disk over until it just begins to touch the sides. Stop the machine and apply freely the mixed emery. Move the vise inwards one-thousandth of an inch and start lapping by moving the handle to and fro until the sides are thoroughly clean on both sides. With this method we are now sure the sides are absolutely parallel



INSPECTOR BENCH GAUGE.

both ways, up and down, and also lengthwise.

On top of this block is located a plate (N) with four fillister screws. One side is cut out to make room for the punch plate (O). In the centre on top of this plate is located the multipying hand (B). This hand is made to register 5-1 and is held on the plate with a turning fit on the shoulder screw (P) by a washer underneath. On the other end is marked the zero line which matches a similar line on the shoulder pin (Q). This is made the same height as the multiplying hand, and is driven into the plate. On each side of the multiplying hand two stop pins (R) are driven into the plate to prevent the spring from breaking. On the side of the multiplying hand in the plate is driven another shoulder pin (S). This is slotted on top in the middle for a flat spring .020 inch thick, which is held with a pin. The spring keeps the muliplying hand away from the work. The sliding 5-16 in. x 7/8 in. gauge (T) is made of tool steel and hardened, ground and lapped to a perfect sliding fit in the block (M), and the point is beveled off so as to give only 1-16 in. bearing surface. The other end is turned 5-16 in. diameter to a driving fit in the knurled handle (U), and held in place with two dowel pins.

To manipulate this gauge, place the receiver (A) in the stop plug (E), located by stud (F). Push in the plug (J) and the sliding plug (T) until it stops. It can there be seen at a glance if the bottom is correct.

MACHINING A LARGE CASTING ON A SMALL PLANER.

By H. P. Dodge.

IN a general jobbing shop it was required to finish both ends of a box casting about 10 feet long, 26 inches wide and 20 inches deep. As there was no planer in the shop large enough to take the job, it was necessary to rig up a temporary arrangement as shown in the accompanying photograph. The tool head was removed from the planer and an extension in the form of a flanged cylinder was bolted to the cross slide. To the end of this projection was bolted the tool head, thus locating the tool about 30 inches in advance of the housings.

One end of the casting was laid on the platen of the planer, crosswise, and the other end was supported by a chain sling carried on a trolley rigged

MACHINING A LARGE CASTING ON A SMALL PLANER.

up to run on an I beam supported by two trusses or horses as shown. The I beam was shimmed up until perfectly level, and when the planer was started, the trolley rolled back and forth along the I beam, supporting the outer end of the casting, while the other end was carried back and forth by the platen of the planer. This expedient worked satisfactorily for the particular job.

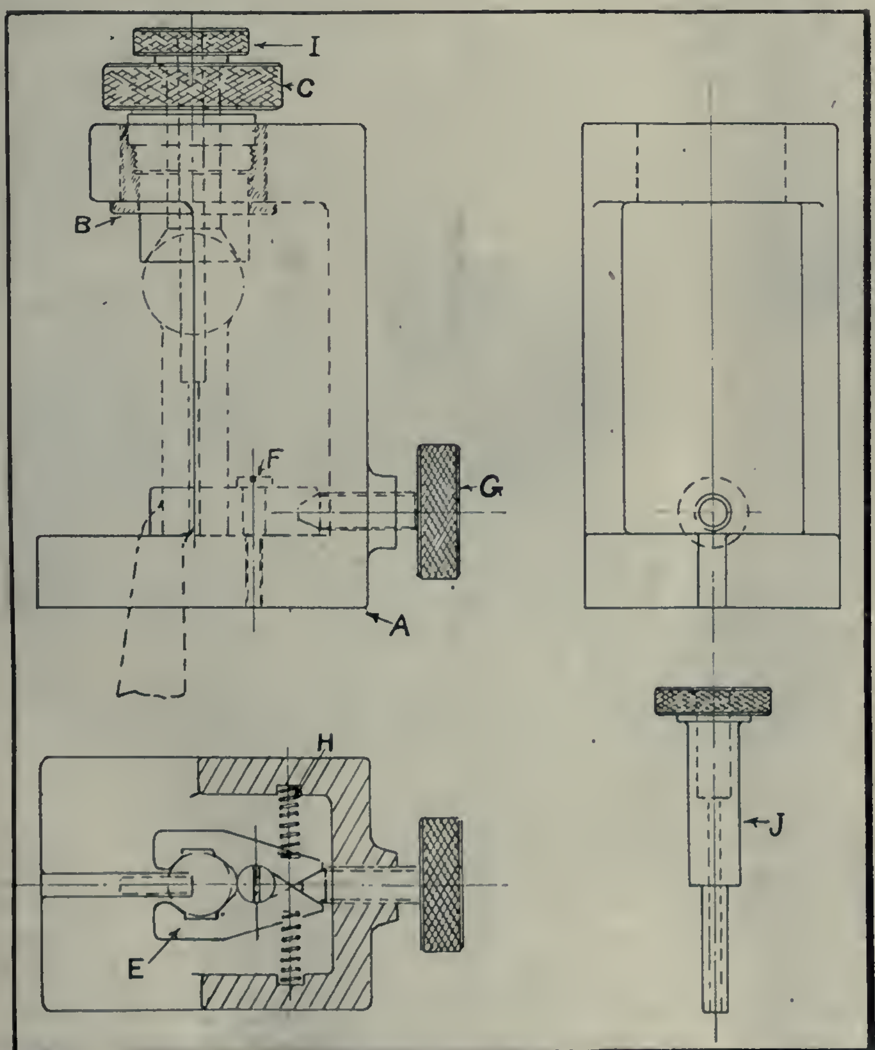
DRILLING BALL HAND LEVERS.

By H. R.

THE sketch illustrates a jig for drilling the ball end of a ratchet change speed lever. It will be noted that same was a difficult job, on account of the lenghts of the holes.

The jig consists of the casting (A), which forms the main body. Into this is fitted the hardened steel screwed bushing (B). This accommodates the screwed bush (C), which has a conical end, so that when screwed down, same will position the ball end of the lever. Fitted to the base of the casting (A) is a pair of small levers (E). These have Vee's cut in them, so as to centralize the lever to be drilled. The levers (E) being pivoted on the fulcrum (F), by adjusting the knurled screw (G) a suitable grip on the lever is maintained. It will be readily seen that when the screw (G) is loosened, the coiled springs (H) release the grip of the levers (E).

The larger hole is drilled first in the drill bush (I) shown in the jig, and the smaller hole is drilled from the bush (J). In order that the hole shall not run out of truth, the drill bush (J) pilots into the hole which is first drilled.



DRILLING BALL HAND LEVERS.

DEVELOPMENTS IN MACHINERY

A Record of New and Improved Machinery Tending Towards Higher Quality and Economical Production in the Machine Shop, Blacksmith Shop or Planing Mill.

LODGE & SHIPLEY "SELECTIVE HEAD" LATHE.

To combine strength, simplicity and durability, the selective type automobile transmission has been adopted for the gear box drive of the new Lodge & Shipley "Selective Head" Lathe; this permits any one of the spindle speeds to be selected instantly—hence the name.

A constant speed single driving pulley running at a high belt velocity delivers an excess of power to the cutting tool under all conditions. As the diameter of the work increases, the gear ratios and the torque proportionately increase; thus, lathe work requiring a maximum amount of power can most advantageously be handled.

Power is transmitted through hardened steel gears mounted on shafts running in ball bearings. This eliminates the great frictional loss in journals and by soft gear teeth common to many types of single pully heads. As the result of these and other refinements, the "Selective Head" attains an exceptionally high mechanical efficiency. Wear of gear teeth and of bearings is reduced to a minimum, making it possible to produce nicely finished work free from gear marks.

Headstock Casting.

The headstock is made of box section, with the sides extended up to the center line of the spindle, making this an unusually rigid casting. Further stiffness is added by the internal bracing with both longitudinal and cross ribs. The back of the headstock is planed to receive the gear box, which is made as a separate unit. Covers totally enclose all gearing

Spindle Speeds.

There are 6 speed changes in the gear box, from which the drive is either direct to the spindle or through shifting back gears in the headstock proper, giving 12 spindle speeds in all back geared lathes from 14 in. to 27 in. inclusive. The 30 in. and 36 in. lathes can be provided with triple gearing when so ordered; this gives 18 speeds. These two sizes are also furnished without triple gearing; they then have 12 changes of spindle speed. In the triple geared lathe, there are 6 speed changes by direct drive from the gear box; another 6 changes through the back gears, and the third set of the slowest 6 speeds is obtained through the triple gearing driving into the internal gear of the face plate. On the 42 in. and 48 in. machines, the triple gearing is always supplied in order to get the speeds sufficiently low to accommodate the large diameters.

Friction Pulley.

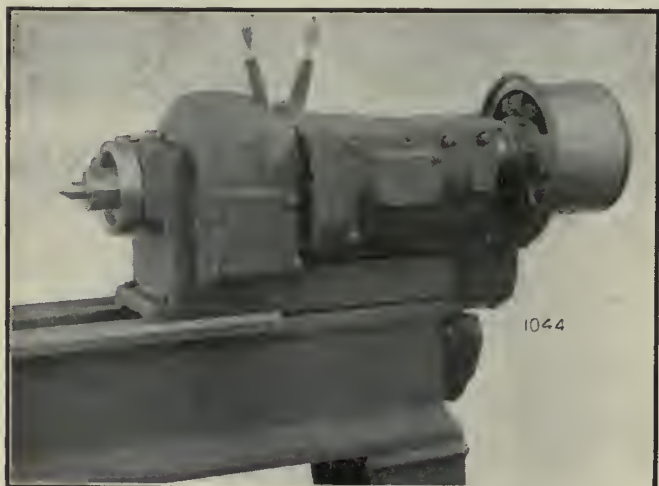
An extended flanged hub attached to the gear box carries the driving pulley, and thus relieves the driving shaft of all belt pull. Inside the pulley are two frictions, one of which drives the initial shaft direct, while the other drives it at a back geared speed. The friction is at the initial point only, to insure a powerful drive, and the friction will easily slip the belt. The ratio of the direct speed to the back-geared speed is about 2.6 to 1. This is approximately the ratio between the finishing and roughing speeds on a given diameter of work; therefore, in order to increase the speed from a roughing to a finishing cut, the gear shift does not have to be made, it being only necessary to shift the friction lever from one side to the other. The friction pulley is entirely enclosed at its outer and to retain the oil for the friction surfaces. A combination oil and belt guard is provided at the inner edge to prevent throwing oil on the belt.

Transmission Gears.

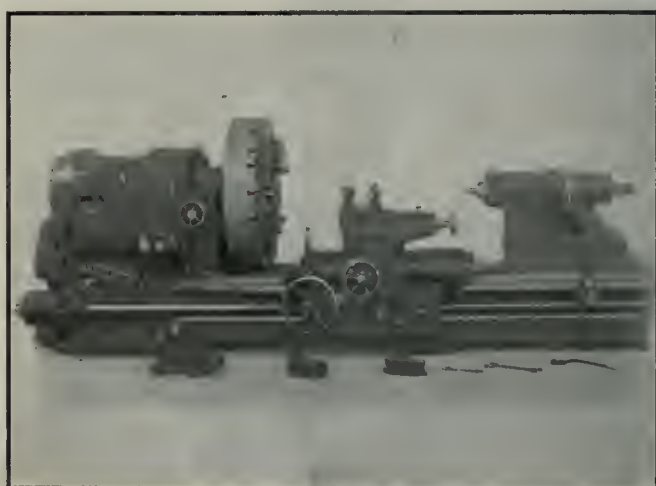
All gears within the gear box are of the stub tooth 20 degree pressure angle type. They are made from chrome nickel steel, heat-treated and hardened. After hardening, the bores of the gears are ground concentric with the pitch circles, and finally the gears are mounted on an arbor in a special machine where the teeth are lapped, so that any distortions due to the hardening are removed. This insures perfectly true gears, easy rolling action and noiseless operation.

Gear Box.

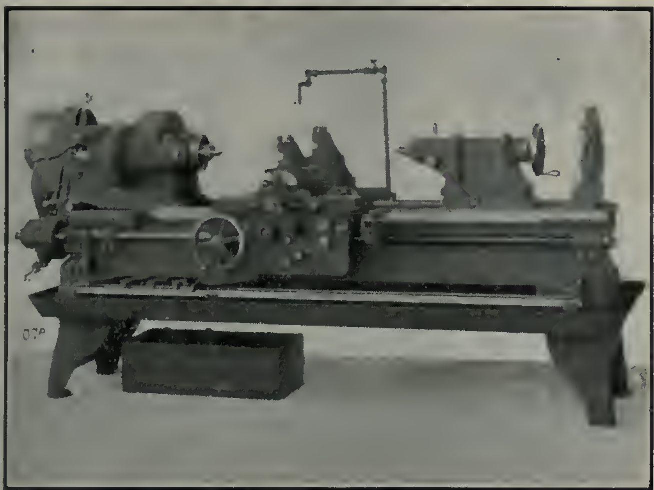
The entire speed changing mechanism, except the back gears of the headstock proper, is contained in the gear box, which is an independent unit tongued and bolted to the back of the headstock. It may be removed at any time without affecting the other parts of the head, or without removing the motor in the case of a motor drive.



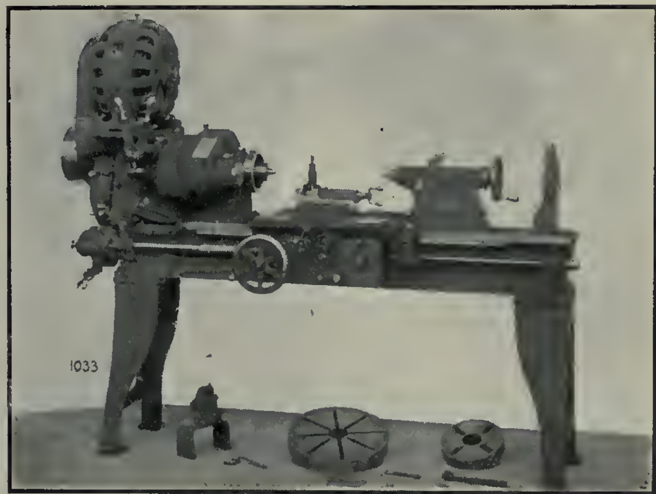
REAR VIEW OF "SELECTIVE HEAD."


48 IN. "SELECTIVE HEAD" LATHE.

The gear box is oil tight and dust-proof. The gears run at all times partly submerged in oil. The initial shaft of the gear box, which has either direct or back geared speed, transmits power to the driven shaft through sliding gears. There are 3 speed changes to the driven



18 IN. BELT DRIVEN "SELECTIVE HEAD" LATHE WITH MANUFACTURING EQUIPMENT OF MULTIPLE STOPS FOR LENGTH AND CROSS FEEDS, PAN, PUMP, TUBING AND CONNECTED COMPOUND AND PLAIN RESTS.



14 IN. MOTOR DRIVEN "SELECTIVE HEAD" LATHE. CONSTANT SPEED MOTOR IS MOUNTED ON THE HEAD AND DIRECT CONNECTED THROUGH SPUR GEARS.

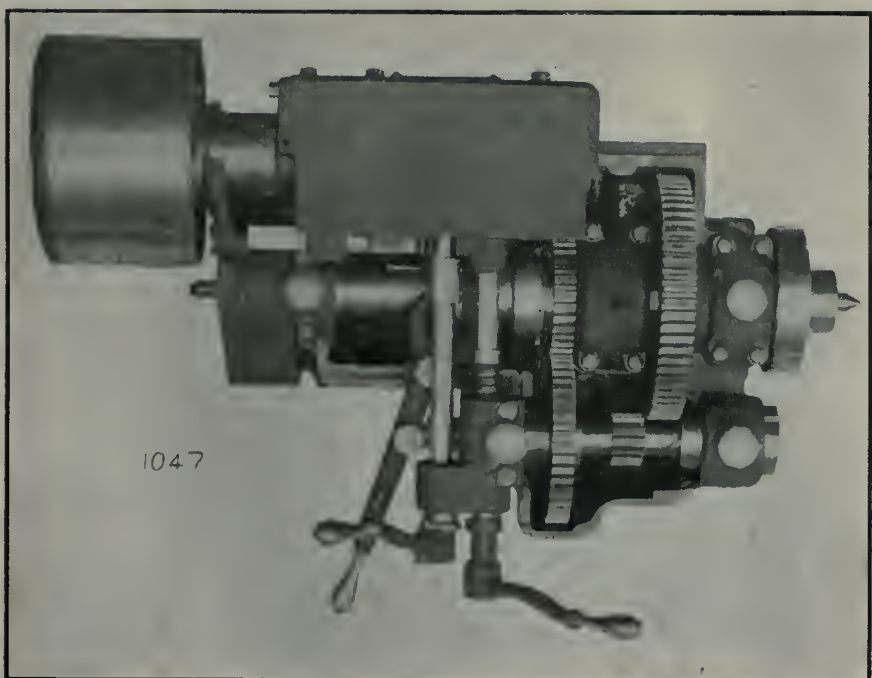
shaft by these sliding gears, which, with the 2 speeds of the initial shaft, give 6 changes of speed obtained within the gear box. The initial shaft in the gear box which receives the sliding gears has its four keys formed upon it. There are no screws or cotter pins inside the gear box, nor other small parts which might work loose and get into the running gears.

Ball Bearings.

Both shafts in the gear box in all sizes of lathes are mounted in anti-friction ball bearings. Threaded dust plates retain the ball bearings in their respective seats, and prevent the admittance of dirt or grit to either the ball bearings or the gear box. No shaft runs at a higher rate of speed, even in the small lathes, than 375 R. P. M. This comparatively low rate of speed and the anti-friction properties of the ball bearings help maintain an exceptionally high efficiency of transmission.

Speed Control.

The 6 speeds provided by the gear box are obtained through two vertical levers, conveniently located on the front of the headstock. The lever nearest the operator controls the two frictions in the driving pulley, and stops, starts and gives fast and slow speeds by moving the lever to the right or left. The other vertical lever shifts the gears, and must be moved to the right or left, and also in or out, to select the required gear. The horizontal lever operates both a positive stopped clutch on the spindle, and the sliding back gear pinion which is interlocked with the clutch so that both cannot be engaged at the same time. A plate on the front of the headstock gives a complete list of all speeds and position of levers for obtaining them.



INTERIOR OF "SELECTIVE HEAD."

Back Gears and Triple Gears.

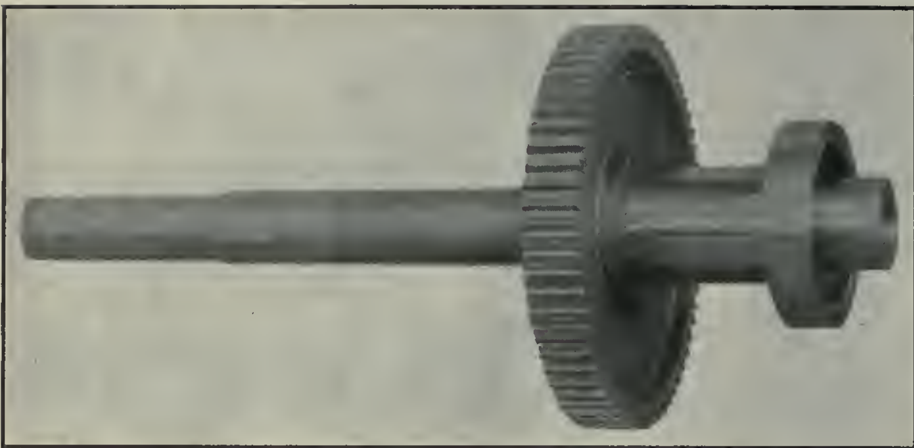
The back gearing is located at the front of the headstock. The back gear shaft and pinion in lathes from 14 in. to 36 in. sizes both inclusive, are cut from a single steel forging. The teeth of the pinion are hardened. The shaft is journalled in continuously lubricated bronze bushings. The triple gear is operated by a hand wheel which slides the triple gear pinion into or out of mesh with the internal face gear. All headstock driving gears are of steel, and as previously explained, gears subjected to the most wear are of chrome nickel steel heat-treated and hardened. On all lathes the gearing is designed to give practically uniform speed progression throughout the entire speed range.

Spindle and Spindle Bearings.

The spindle is of large diameter and made from chrome nickel steel. The end thrust is taken against the rear housing by alternate bronze and hardened steel thrust washers. The spindle bearings are of special composition white metal, renewable and interchangeable, and are continuously lubricated by wick oilers from large oil wells. These white metal bearings are faced and turned in halves to exact gauge size; the headstock casting being reamed to this same size. The screw holes are drilled by jig.

Spindle Nose.

The spindle has a double nose, consisting of an inner cylindrical portion and an outer cup. The cup is threaded internally to hold the chuck plate in position, and the end is faced to provide a very large diameter shoulder against which the face plate is tightened. The inner cylindrical portion of the nose is left blank, and extends beyond the outer nose, so as to form a pilot to receive the face plate or chuck plate. This pilot at all times accurately centers the chuck plate, and, by centering the bore of the chuck plate before the threaded portion is reached, insures that the threads engage easily, and that the chuck plate may be readily drawn squarely against the face of the outer nose. It is a comparatively easy matter to accurately fit a chuck plate to this spindle, as the bore may be reamed standard size to fit the pilot, and the thread is used only to hold the plate in position against the face of the cup. The threading of the chuck plate is easily done, as it is a job of external chasing. The large diameter of the shoulder afforded by the cup prevents the face plate becoming stuck to the spindle nose, and makes it always an easy matter to remove the face plate or chuck.



SPINDLE AND FACE GEAR FROM "SELECTIVE HEAD" LATHE, SHOWING NEW TYPE SPINDLE NOSE.

Spindle noses of "Selective Head" lathes from 14 in. to 20 in. inclusive are made to the same standard, so that chucks will interchange from one lathe to another between these sizes. Similarly, another standard is used for all lathes from 22 in. to 36 in. As the larger lathes are triple geared, there are but the two sizes of spindle noses for the entire range of lathes.

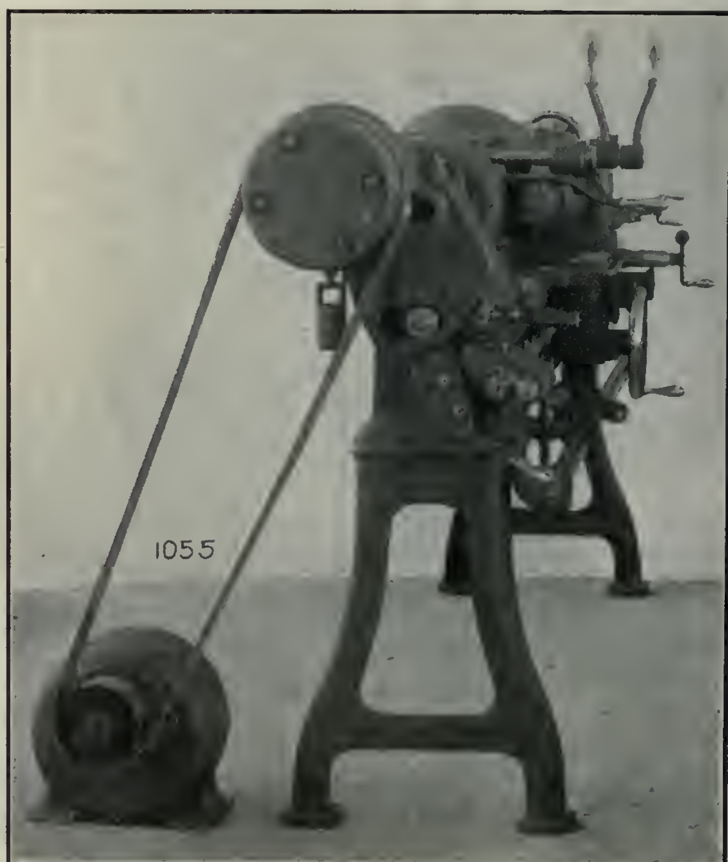
No countershaft is necessary with this lathe, if the machine can be placed near the line shaft, and the drive may be either with straight or quarter turn belt. If a countershaft is required, either a single speed plain tight and loose pulley counter shaft or a double friction countershaft may be furnished.

Motor Drives.

Any standard make of motor, either direct or alternating current, constant or variable speed, within reasonable limits of size and speed can be mounted on the top of the headstock and direct connected through gearing, a gear which contains the same friction mechanism as the pulley, being substituted for the pulley at the end of the gear box. A suitable casting is mounted at the end of the headstock cover, and carries on intermediate fibre gear running in positively lubricated journals. This casting serves as a gear guard and cover for all of the motor drive gears. A pinion on the armature shaft meshes with the intermediate fibre gear, thus giving a direct drive to the gear box of the headstock. The user may at any time drive a regular belt driven "selective Head" lathe from an individual motor placed on the ceiling, or on the floor, and direct connected to the head stock pulley by a belt, constituting the "simplicity" motor drive. A constant speed motor is generally used for this style of drive.

Lathe Details.

The bed is made from close grain iron of high tensile strength, and the top is cast against a chill which makes it very hard and dense, and greatly increases the life in alignment. The chill so closes the pores of the iron that dirt and grit cannot become imbedded in the ways to wear the carriage by a lapping action. The tail stock has floating binders to insure correct alignment of the tail stock spindle. Clamping bolts for holding the tail stock to the bed are operated from the top of the barrel. In 22 in. lathes and larger, a pawl on the base of the tail stock engages the rack in the center rib of the bed, to afford a positive brace. The quick change gears for feeds and threads are of drop



16 IN. "SELECTIVE HEAD" LATHE WITH "SIMPLICITY" MOTOR DRIVE. MOTOR IS PLACED ON FLOOR AND BELTED DIRECT TO THE REGULAR DRIVING PULLEY.

forged steel, located beneath the headstock, and firmly supported in the walls of the bed. Changes of feed or thread can be quickly made while the lathe is under cut.

The carriage is gibbed inside and out, has oil trough around the front and rear wings, and the extra wide bridge takes a supplementary scraped bearing against the inside horizontal and vertical flat surfaces of the bed, thus providing a positive support directly in line with the tool thrust. The compound rest has a special square base so designed that the top slide cannot be overhung, which provides a solid metal-to-metal anvil support under the tool to prevent any vibration. The apron is self contained and double walled with studs supported front and rear. All gearing except the frictions is of steel, and a stub tooth rack pinion insures greater strength. Manufacturing equipment consisting of multiple stops for length and cross feeds, connected compound and plain rests, pan pump and tubing, and a fourway tool block can be furnished with any of these lathes. These are valuable additional appliances for turning repetition work.

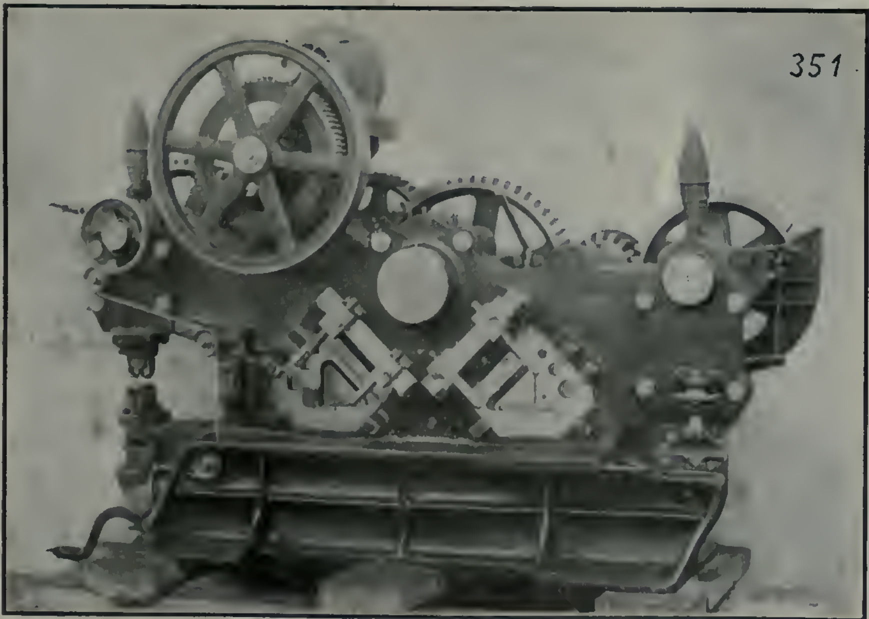
The Lodge & Shipley Machine Tool Co., Cincinnati, Ohio, are the builders of the foregoing specialties.

QUADRUPLE COMBINATION PUNCH AND SHEAR.

THE Wiener Machinery Co., New York, as managers of the Oeking Co., have placed on the market a Quadruple Combination Machine, of the "imperator" type, which is illustrated herewith. The design is the result of the success achieved by the Oeking solid steel frame triple combination machines, and of many inquiries received for a combination machine which could miter angles, right and left, without changing knives. It was also found that a market existed for machines which, besides cutting and mitering angles, rounds and squares, would cut beams and chanels.

There are contained in one frame, ready for work, all the tools for almost any kind of cutting, shearing, coping, mitering and notching. The frame, being one massive piece of steel, permits a compactness which makes the machine most suitable and economical for crowded shops. It recommends itself also for plants where driving power is limited. The "Imperator" machine will, without change of tools, split plates of unlimited length; cut flat bars; shear off rounds and squares; cut and miter angles and tees, right and left, and punch plates and structural material, both webs and flanges.

With interchangeable tooks, beams and channels, or any other shape can be cut, while the punching tools can be interchanged for coping, mitering, etc. The machines are built in three sizes, and can be furnished with tight and loose pulleys for belt drive, arranged for direct motor drive, or if so desired, can be mounted on a turntable, to facilitate mitering long angle irons. The cost of the Combination Machine is claimed to be no more than that of the equivalent single machines, while being much more economical in operation.



WIENER QUADRUPLE COMBINATION PUNCH AND SHEAR.

CANADIAN CAR AND FOUNDRY.

WORK on the various plants of the Canadian Car and Foundry Co. is proceeding apace. The new steel car plant at Amherst, N.S., is fast nearing completion, and will be turning out its full complement of 20 cars a day some time this month. This plant is built on the very latest model, and is capable of turning out either all steel or composite cars.

The addition to the rolling mill consists of another 18-inch mill, driven by a 750 h.p. engine. The building is 100 by 200 feet, and the department is now in operation. A department is being added for the manufacture of springs, the space required being 80 feet square. The machinery has been ordered which, when installed, will enable the firm to make springs for car building and other purposes. The necessary motors have already been obtained.

The largest recent addition is the new shop for making bolsters, steel cars and fabricating structural steel for building. This shop is 180x500 feet. The construction is steel frame, concrete and hollow tile walls. About 600 h.p. will be required to operate these shops, and practically all equipment has been purchased.

Progress on the Fort William plant is very satisfactory. The Dominion Bridge Co. has made good headway, and already has completed steel work for over 500 feet on both of the main aisles; and, in addition, has made good progress on power house structure. Over 120 men are working on the buildings and plant. The figures furnished above show that about 50 per cent. of the car plant is already erected.

Extensions which practically double capacity of the Brantford plants, are now completed. These cost over $150,000. The net result is that these plants, formerly known as Pratt and Letchworth, have doubled their output.

Though exact figures are not available, it is known that the company has already to its credit larger profits than this time a year ago. Increase in sales has been large, and a sufficient volume of new business is on the books of the company to warrant a large further increase before the end of the year. A proportionate amount of this, of course, represents increased profits. Geo. T. Douglas is manager of the car works.

Montreal.—Mr. Justice Demers has given a judgment which makes it clear that an architect may not practice in the Province of Quebec without being a member of The Association of Architects of the Province of Quebec. The cases before His Lordship were those of the Association against A. H. Paradis and A. Trudel. They were fined $1 and costs each.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

JAR RAM STRIPPING MACHINE.

A NEW and useful jar ram stripping machine has been developed and placed on the market by the Herman Pneumatic Machine Co., Zelienople, Pa. The purpose of this product is to meet the need of a jarring machine to handle flasks that are not large, yet comparatively deep. There are many types of hand ram stripping plate machines now on the market, but as the advantages of the jar ram method are so well known, it is not necessary to rehearse same here.

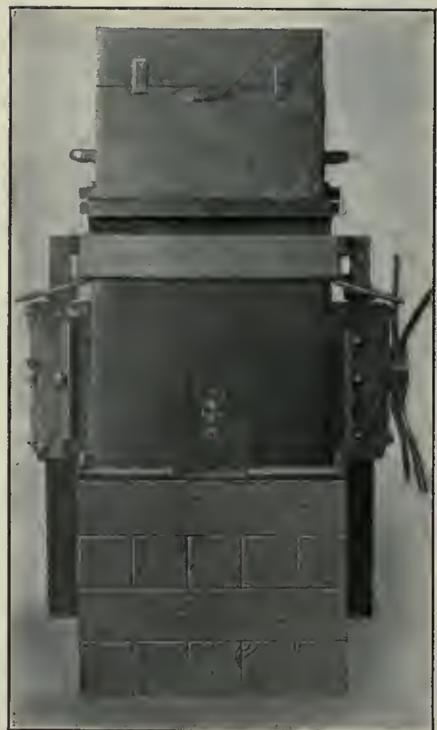


FIG. 1—FLASKS AND STRIPPING PLATE RESTING ON TABLE PLATE.

Fig. 1 shows the flask in place, rammed up by the jarring method. Fig. 2 shows the flask stripped off pattern, the pattern itself being fastened to the pattern plate, which in turn fastened securely to the table plate. The stripping plate surrounds the pattern and rests on suitable raised strips on the pattern plate. Fig. 3 shows the mold removed from the machine, and stripping plate let down over the pattern ready to make another mold. Fig. 4 is a side view showing the exterior construction of the machine, and also the manner in which the stripping plate is ribbed in order to conform with the ribs on the pattern plate. The pawl used for locking the stripping mechanism at any desired height is also shown.

This jar ram stripping machine consists of a cast iron base, having an equaly distributed resilient jarring surfaces, the table plate and plunger being of cast steel, in one piece, with cast iron packing rings. The oiling system for the plunger and cylinder is within the first named, where a storage reservoir provides sufficient oil to insure lubrication to cylinder and plunger for some time. The control valve is a Herman automatic sand proof mechanism, and is applied to all machines of their make. The stripping mechanism is formed of two steel racks, one on each side of machine, and steel gears meshing in the rack, both accurately machined. These gears are securely fastened to a shaft passing through the machine, insuring both racks raising together. The aforesaid shaft has four sand proof bearings, and the stripping rack has a long adjustable babbitted bearing, which allows for taking up lost motion caused by the rack running in its bearing.

The ratio of leverage between the handles of the gear is about 6 to 1, therefore, a flask weighing from 200 to 300 pounds can be stripped with very little exertion on the part of the operator. All moving surfaces and bearings are fully protected from sand, and have the latest design of spring oilers to which easy access is assured. Very little foundation is required for this machine, same being formed of timbers and a small amount of concrete.

FIG. 2—MOLD STRIPPED OFF PATTERN.

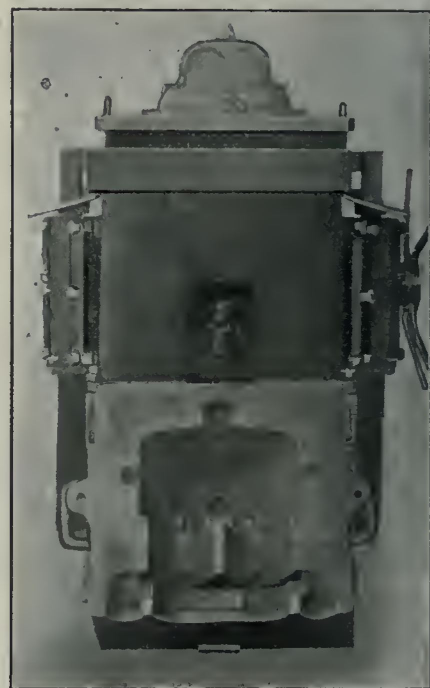


FIG. 3—MOLD REMOVED AND STRIPPING PLATE IN POSITION FOR MAKING ANOTHER MOLD.

The size table plate shown in the illustrations is 16½ in. x 18 in., with 12 in. draw.

PATTERN SHOP AND FOUNDRY.

IN the course of a paper read before the St. Louis Branch of the Associated Foundry Foremen, Mr. William Hommel, the author said:

"That up-to-date pattern shops should be equipped with the best possible machinery obtainable, and the various tools should be so arranged that the patternmaker will lose the least possible time in walking from one machine to the other. For example, the cut-off or band saw should be close to the lumber rack, and the rip saw, jointer and surface planer should follow in the order named. The best possible material should be purchased for making patterns, which include lumber, shellac, glue, etc. For all rough work and one or two casting jobs, an inferior grade of lumber should be kept in stock. Also, many patterns can be made in plaster and wax that would require much more time to produce in

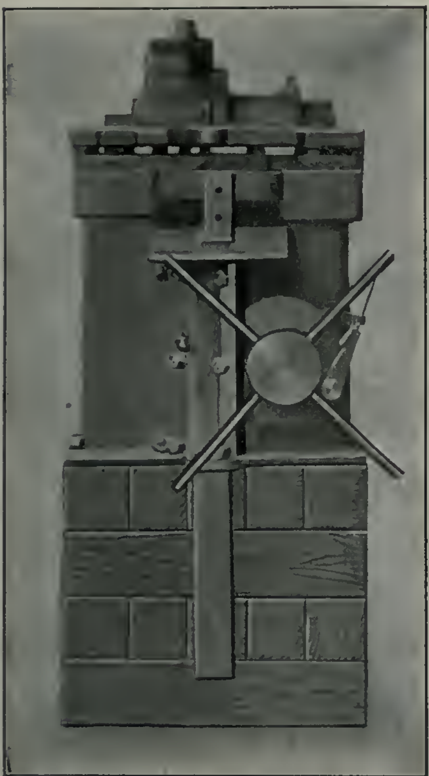


FIG. 4.—SIDE VIEW OF COMBINATION JAR AND STRIPPING PLATE MACHINE.

wood. This applies principally to patterns for architectural work.

"When the word harmony is applied to the relations existing between the pattern shop and foundry, it follows that there is a minimum of friction between the two departments, and a maximum of output. The patternmaker should not slight his part of the work, thereby causing trouble for the molder, and, on the other hand, the molder should not expect the patternmaker to devote unnecessary time to a pattern which can be satisfactorily molded with a little extra care on the part of the molder. Frequent consultations between the patternmaker and the foundry foreman will result in avoiding much unpleasantness.

A conscientious patternmaker usually will endeavor to make a pattern to meet the requirements of the molder. However, care should be exercised in handling patterns, as it seems that frequently a sledge hammer is employed for rapping. Another great fault I find is the way many molders use their swabs. A wood pattern, regardless of the number of coats of shellac applied, will soon warp as a result of the too liberal use of the swab.

"The cost of the castings should always be carefully considered by the foremen of both departments."

GASOLINE ENGINE PISTON MOLDING MACHINE.

FOR molding gasoline engine pistons the Arcade Mfg. Co., Freeport, Ill., has recently designed special pattern equipment which may be fitted to its standard type molding machine without alteration of the essential features of the latter. The attachments, which include a split drag pattern and a cope stripping plate, were developed primarily to meet the requirements of the Ford Motor Co., Detroit.

The Ford plant is operating this year with an output of 800 cars daily, requiring 3,200 pistons. In addition, a large number of extra pistons are manufactured and shipped to branch houses carrying stocks of spare parts, together with quantities of special oversize pistons, which are used to replace standard pistons in cylinders that have become worn by use. In other words, the Ford Co. is casting about 300 tons of pistons per month, this being equal to the total output of many foundries of respectable size.

When made by hand on plain stripping plate machines, using dry sand cores, and allowing an output of 200 pistons per man, a gang of from 30 to 35 men was required, including core labor. With the Arcade machine four pistons are made in a flask and a daily output of 150 flasks per man is expected. The core room work will be eliminated, and the labor in the piston department reduced to one-fourth or one-fifth the amount necessary when using dry sand cores.

The pattern plates are mounted on the revolving table of the machine, and fig. 1 shows the patterns in position ready to receive the cope and drag flasks. The drag pattern at the left contains split cup sections, which are controlled by the linkwork (L). When the ramming operation is completed, the split cups separate, thus releasing the sand contained in the green sand cores. The cope pattern is simply a plain stripping plate which permits the mold to be made without draft.

In operating the machine, the flasks are placed on the pattern plates when they occupy the position shown in fig. 1, the sand being thrown in, the surplus scraped off, and the cope and bottom boards clamped in place. The table is next rolled over, the mold pressed, and the patterns drawn in the customary manner. Drag and cope halves of the mold are shown in fig. 2. Of course, before the pattern plates are lifted, the lever controlling the linkwork connected to the split cup patterns is shifted, re-

FIG. 1.—ARCADE PISTON MOLDING MACHINE.

leasing the cores. The wrist pin bosses and reinforcing rings are all made in the core. When the patterns are drawn, the drag rests right side up on the platen of the machine with the green sand cores extending upward.

All that is necessary to complete the mold is to place the cope in position over the drag and set the flask onto the floor. The long lever at the left of the machine is used in drawing the patterns, and the clamps holding the cope and bottom boards are automatically released. The machine is also equipped with a pneumatic vibrator and automatic trip for vibrating the pattern. Being on wheels, the machine may be moved along the pile of sand as the operator makes up his floor, thus reducing the amount of walking to a minimum.

The metal is poured through a single central runner which connects with a cross gate in the drag. The iron rises in the mold from the bottom, insuring sound, dense castings. The details of the gate and runner are clearly indicated by the castings shown in the lower right hand corner of each illustration.

FOUNDRY ELEVATOR GUARDING.

WILLIAM H. DOOLITTLE, Safety Inspector of the National Metal Trades Association, writes to "The Review" on the subject of "Foundry Elevator Guarding," as follows:

"In all foundries where the cupola charging floor is above the level of the yard, it is necessary to provide some means of getting iron, coke and other materials up to the charging floor. The device used most commonly for this purpose is the elevator. The material is loaded on trucks or barrows, run onto the elevator platform at the yard level, and by it raised to the required height. The elevator is usually operated by the laborer who brings to the cupola the load of material. There is, therefore, considerable danger of these unskilled workmen being injured by the elevator, and very careful guarding is desirable.

"There should be strong gates at both floors, which should be automatic in action, and maintained in perfect working condition. No workman should ever be allowed to fasten either gate in its high position, since, by doing so, the entrance to the elevator shaft is left unprotected and some one may enter it, and be injured. The lower gate should either be so high that a man may not put his head over it, or so low, that in event of his doing so, he will not be caught by the descending platform. The upper gate should be extended to the floor, preventing material dropping from the charging platform on the heads of workmen below. If there is not sufficient movement of the gate to allow this being done, a heavy wire screen may be installed, which covers the cage, and protects men who are riding, from falling material.

"If the elevator is lifted by cables there should be upper and lower limit stops attached to the mechanism independent of those on the operating rope, and they should be frequently inspected and carefully adjusted. The safety gripping device should be kept in perfect order so that it will act instantly in case of the breakage of the cables or failure of the hoisting machinery. Counterweights, if in the elevator shaft, should be enclosed, and that part of the platform adjacent to the counterweight screened. The lower sides of floor joists, beams and all other projections in the elevator shaft should be beveled or slanted, so that material or men may not be caught between these projections and the platform of the elevator. The slant should be long and gradual.

"It is dangerous to raise truck loads of material on a foundry elevator without making provision against their rolling off. The wheels should be blocked by sprags or dogs or some other method used to prevent accidents from this source."

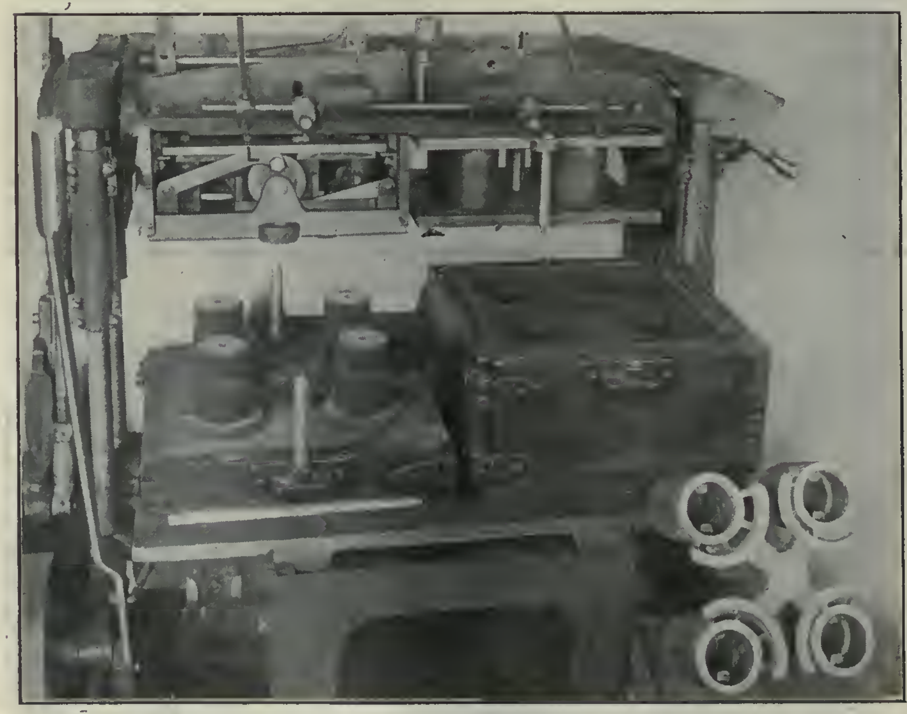


FIG. 2.—ARCADE PISTON MOLDING MACHINE WITH PATTERN DRAWN.

ZINC PRODUCTION.

THE production of zinc in Europe last year was 650,670 tons, or 27,750 tons more than in 1911. This increased production was arrived at as follows:—Belgium, 5,025 tons more; Silesia, 12,710 tons more; France and Spain, 7,815 tons more; Rhenish Prussia, 7,635 tons more; Great Britain, 9,570 tons less; Holland, 1,180 tons more; Austria and Italy, 2,685 tons more; Poland, 1,155 tons less; and Norway, 1,425 tons more. Zinc was also produced in the United States last year to the extent of 309,560 tons, showing an increase of 46,300 tons. The aggregate production of zinc throughout the world in 1912 was 962,490 tons, or 70,610 tons in excess of the corresponding output in 1911. The average price of rough zinc last year was $126.50 per ton, as compared with $121.00 per ton in 1911, showing an advance of $5.50 per ton.

SAFETY RULES.

IN a recent article, entitled "Safety Rules," the vice-president of the Efficiency Society suggests for the engine room and other parts of a plant the following:—

All injuries, no matter how slight, should receive proper medical attention.

Never remove or even touch a safety flag or ticket. The man who places it should always remove it.

Safety committees may have overlooked something; therefore, see for yourself that everything is safe.

Take notice of all danger signs, and see that no one disregards them.

Safety devices must be maintained and used as planned, or they are of little value.

Careful men are usually efficient; careless men are not. Use safety devices always. Don't take a chance.

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Toronto, 143,-149 University Ave., Phone Main 7324
Winnipeg, 34 Royal Bank Bldg., Phone Garry 2313
Vancouver, H. Hodgson, 2640 Third Ave. West.

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Vol. X. JULY 10, 1913 No. 2

PRINCIPAL CONTENTS.

THE FACTORY MOTIVE POWER SITUATION.

THE more or less frequent interruptions, which Ontario manufacturers have recently experienced through the failure of their electric power supply, have not been such as to inspire confidence in the all sufficiency and dependability of a motive power whose transmission from the source of generative to its place of application, involves long, exposed and apparently easily vulnerable lines.

The vision of harnessing Niagara until not a drop comes over the Falls, leaving a bare, steep cliff, is dangled in front of our imagination to help sound the death knell (?) of "power generation by fuel combustion," and all too much attention is being directed to coal and oil supply exhaustion, and under cover of it, opportunity taken to knock steam and internal combustion engines. It is altogether too obvious, this "drumming out" and "buying out" business. Power generation by fuel combustion is a serious competitor of both Hydro and Toronto Electric, and each has to come some to meet this competition. We are not seriously worrying as to when the supply of combustible peters out, but we do want now the cheapest and most dependable power with which to carry on our business. Glorifying this or that promoter, and knocking this or that opposition, are each uncalled for, and show weakness and bad taste; besides being unbeneficial generally.

It seems to be forgotten that power users are out for the power supply that will pay them best now, and on this ground only must any public utility corporation who cater to them be judged. Too much dependence and blind trust has been placed in the almightiness of one or two individuals connected with Hydro-Electric, with the result that industrial Ontario has been brought practically under obligation to it. Shut-downs in our factories are becoming of a more frequent and prolonged nature, and no self respecting management can afford to allow its business to be demoralized with impunity by any power corporation. There is broadest ignorance concerning cheap power, thanks to the importunate and persistent campaign propaganda in operation by those opposed to steam power and fuel combustion generation systems.

Much loose talk is being indulged in regarding the establishment of steam auxiliary plants by our supply corporations, and if one thing serves more than another to show how much our industries are at the mercy of incompetent power management, it is the connoiseur air adopted by men who could not distinguish between a motor and a roll of toilet paper. The auxiliary steam plant proposition, let us add, will be in no sense a cure-all, and is nothing more or less, than a bare-faced bluff. A year ago, Toronto Electric, when its troubles had reached "peak load," set about the auxiliary proposition, so as to protect their customers. How well they have succeeded, everybody knows. Hydro-Electric a year ago, was "cock of the walk," and infallible; to-day it is panicky and its administration at sixes and sevens.

The works or factory power plant is more dependable than any source of power, where long transmission lines intervene, and we are rather of opinion that the overdue return to its own of the individual power plant is within measurable distance.

SERIES OF ARTICLES ON SCREW CUTTING.

DUE to a typographical error in the notice appearing in our last week's issue, relative to a Series of Articles on "Screw Cutting," July 10 instead of July 17 was given as the commencement date.

We take the opportunity of repeating again for the benefit of a large section of our readers to whom such a series of Articles should appeal, that the writer is an expert mechanic, and has been accustomed to instruct students from the practical and easily intelligible standpoint. The attention of apprentices particularly, and all others who desire to acquire a knowledge of the art from the bottom up, is therefore directed to the forthcoming series.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

	Per Ton.	
Foundry No. 1 and 2, f.o.b., Midland	$19 00	$19 50
Gray Forge, Pittsburg	....	14 65
Lake Superior, charcoal, Chicago	.....	16 25

	Mont'l.	Tor'to.
Canadian f'dry, No. 1..	$21 00	$20 00
Canadian f'dry, No. 2..	20 50	19 50
Middlesboro, No. 3....	23 50	23 50
Summerlee, No. 2	25 00	26 50
Carron, special	25 00	.....
Carron, soft	25 00	.....
Cleveland, No. 1	24 25	25 00
Clarence, No. 3	23 75	24 50
Jarrow	.....	25 50
Glengarnock	.....	26 00
Radnor, charcoal iron.	30 00	34 50
Ferro Nickel pig iron (Soo)	.....	25 00

BILLETS.

	Per Gross Ton.
Bessemer billets, Pittsburgh ..	$26 50
Open hearth billets, Pittsburgh	26 50
Forging billets, Pittsburgh	34 00
Wire rods, Pittsburgh	29 00

FINISHED IRON AND STEEL.

Per pound to large buyers:

	Cents.
Common bar iron, f.o.b., Toronto..	2.10
Steel bars, f.o.b., Toronto........	2.20
Common bar iron, f.o.b., Montreal.	2.15
Steel bars, f.o.b., Montreal........	2.25
Bessemer rails, heavy, at mill....	1.25
Iron bars, Pittsburgh	1.65
Steel bars, Pittsburgh, future	1.40
Tank plates, Pittsburgh, future...	1.45
Beams, Pittsburgh, future	1.45
Angles, Pittsburgh, future	1.45
Steel hoops, Pittsburgh	1.60

Toronto Warehouse f.o.b., Toronto.

	Cents.
Steel bars	2.30
Small shapes	2.45

Warehouse import, freight and duty to pay:

	Cents
Steel bars	1.95
Structural shapes	2.05
Plates	2.05

Freight, Pittsburgh to Toronto:

18 cents carload; 21 cents less carload.

BOILER PLATES.

	Mont'l.	Tor'to.
Plates, ¼ to ½-in., 100 lbs.	$2.35	$2.35
Heads, per 100 lbs.........	2.65	2.95
Tank plates, 3-16 in.	2.60	2.60
Tubes, per 100 ft., 1 inch	9.00	8.50
" " 1¼ in.	9.00	8.50
" " 1½ "	9.00	9.00
" " 1¾ "	9.00	9.00
" " 2 "	8.75	8.75
" " 2½ "	11.50	11.50
" " 3 "	12.00	12.00
" " 3¼ "	13.75	13.75
" " 3½ "	14.50	14.50
" " 4 "	18.00	18.00

BOLTS, NUTS AND SCREWS.

	Per cent.
Stove bolts	80 & 7½
Machine bolts, ⅜ and less	65 & 5
Machine bolts, 7-16.......	57½
Blank bolts	57½
Bolt ends	57½
Machine screws, iron, brass	35 p c.
Nuts, square, all sizes.....	4c per lb off
Nuts, Hexagon, all sizes..	4¼ per lb off
Flat and round head.....	35 per cent.
Fillister head	25 per cent.
Iron rivets	60, 10, -0 off
Wood screws, flathead, bright	85, 10 p c off
Wood screws, flathead, brass	75, 10 p c off
Wood screws, flathead bronze	70, 10 p c off

National-Acme "Milled Products."

Sq. & Hex Head Cap Screws	65 & 10%
Sq. & Hex Head Cay Screws	65 & 10%
Rd. & Fil. Head Cap Screws	45-10-10%
Flat & But. Head Cap Screws	40-10-10%
Finished Nuts up to 1 in. ..	75%
Finished Nuts over 1 in. ..	72%
Semi-Fin. Nuts, up to 1 in...	75%
Semi-Fin. Nuts over 1 in.....	72%
Studs....	65%

Discounts f.o.b., Montreal.

WROUGHT IRON PIPE.

The following are Toronto jobbers' discounts on pipe in effect from April 21, 1913:

Standard	Buttweld Black	Buttweld Gal.	Lapweld Black	Lapweld Gal.
¼ ⅜ in.	62	47	....	....
½ in.	68	58	....	....
¾ to 1½	71½	61½	68½	58½
2 in.	71½	61½	68½	58½
2½ to 4 in. ..	71½	61½	70½	60½
4½ to 6 in.	....	....	71½	61½
7, 8, 10 in.	....	....	66	54

X Strong P. E.

¼, ⅜, ½in. ..	56½	46½	....	....
¾ to 1½ in. ..	67½	57½	....	....
2 to 3 in.	68½	58½	....	....
2½ to 4 in. ..	....	....	65	55
4½ to 6 in. ..	....	....	64	56
7 to 8 in.	....	....	55	45

XX Strong P. E.

½ to 2 in.	43	33	....	....
2½ to 4 in. ..	....	....	43	33

PRICES OF WROUGHT IRON PIPE.

Standard. Nom. Diam.	Standard. Price. per ft.	Extra Strong. Sizes Ins.	Extra Strong. Price per ft.	D. Ex. Strong. Size Ins.	D. Ex. Strong. Price per ft.
⅛in	$ .05½	⅛in	$ .12	½	$ .32
¼in	.06	¼in	.07½	¾	.35
⅜in	.06	⅜in	.07½	1	.37
½in	.08½	½in	.11	1¼	.52½
¾in	.11½	¾in	.15	1½	.65
1 in	.17½	1 in	.22	2	.91
1¼in	.23½	1¼in	.30	2½	1.37
1½in	.27½	1½in	.36½	3	1.86
2 in	.37	2 in	.50½	3½	2.30
2½in	.58½	2½in	.77	4	2.76
3 in	.76½	3 in	1.03	4½	3.26
3½in	.92	3½in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4½in	1.27	4½in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.86	...	.....
7 in	2.38	7 in	3.81	...	.....
8 in	2.50	8 in	4.34	...	.....
8 in	2.88	9 in	4.90	...	.....
9 in	3.45	10 in	5.48	...	.....
10 in	3.20	....	....	...	.....
10 in	3.50	....	....	...	.....
10 in	4.12	....	....	...	.....

IRON PIPE FITTINGS.

Canadian malleable, 40 per cent.; cast iron, 65; standard bushings, 70; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 75; malleable, lipped unions, 65.

COKE AND COAL.

Solvay Foundry Coke	5.95
Connellsville Foundry Coke	5.45
Yough, Steam Lump Coal	3.93
Penn. Steam Lump Coal	3.63
Best Slack	2.95

All net ton f.o.b. Toronto.

OLD MATERIAL.

	Mont'l.	Tor'to.
Copper, light	$10 50	$11 50
Copper, crucible	13 00	14 50
Copper, uncr'bled, heavy	12 00	12 50
Copper wire, uncrc'bled	12 00	12 50
No. 1 machine compos'n	10 50	11 50
No. 1 comps'n turnings	9 50	9 50
No. 1 wrought iron	.....	9 00
Heavy melting steel	.....	8 00
No. 1 machine cast iron	.....	14 00
New brass clippings	8 50	8 50
No. 1 brass turnings	7 25	7 80
Heavy lead	3 25	2 90
Tea lead	2 50	2 50
Scrap zinc	3 25	3 50

Dealers' purchasing prices.

METALS.

	Mont'l.	Tor'to.
Lake copper	17.00	14.75
Electrolytic copper	17.00	14.75
Spelter	6.00	5.50
Lead	5.25	5.10
Tin	43.75	43.00
Antimony	10.00	9.75
Aluminum	21.00	22.00

SMOOTH STEEL WIRE.

No. 6-9 gauge, $2.35 base; No. 10 gauge, 6c extra; No. 11 gauge, 12 extra; No. 12 gauge, 20c extra; No. 13 gauge, 30c extra; No. 14 gauge, 40c extra; No. 15 gauge, 55c extra; No. 16 gauge, 70c extra. Add 60c for coppering and $2 for tinning.

Extra net per 100 lb.—Spring wire; bright soft drawn, 15c; charcoal (extra quality), $1.25.

SHEETS.

	Mont'l.	Tor'to.
Sheets, black, No. 28	$2 85	$3 00
Canada plates, ordinary, 52 sheets	2 80	3 00
Canada plates, all bright	3 70	4 15
Apollo brand, 10¾ oz. (American)	4 30	4 20
Queen's Head, 28 B.W.G.	4 50	....
Fleur-de-Lis, 28 B.W.G.	4 20	....
Gorbal's Best Best, No. 28	4 45	....
Viking Metal, No. 28	4 40	....

NAILS AND SPIKES.

Standard steel wire nails, base	....	$2 40
Cut nails	$2 60	2 65
Miscellaneous wire nails	75 per cent.	
Pressed spikes, ⅝ diam., 100 lbs.	....	2 85

FINE STEEL WIRE.

Discount 25 per cent. List of extras. In 100-lb. lots: No. 17, $5; No. 18, $5.50; No. 19, $6; No. 20, $6.65; No. 21, $7; No. 22, $7.30; No. 23, $7.65; No. 24, $8; No. 25, $9; No. 26, $9.50; No. 27, $10; No. 28, $11; No. 29, $12; No. 30, $13; No. 31, $14; No. 32, $15; No. 33, $16; No. 34, $17. Extras net. Tinned wire, Nos. 17-25, $2; Nos. 26-31, $4; Nos. 30-34, $6. Coppered, 75c; oiling, 10c.

MISCELLANEOUS.

	Cents
Putty, 100 lb drums	$2.70
Red dry lead, 560 lb. casks, per cwt.	6.00
Glue, French medal, per lb	0.10
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.26
Benzine, per gal.	23½
Pure turpentine	0.60
Linseed oil, raw	0.60
Linseed oil, boiled	0.63
Plaster of Paris, per bbl.	2.10
Plumbers' Oakum, per 100 lbs.	3.25
Pure Manila rope	17

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents.

Montreal, July 8, 1913.—One of the largest independent iron and steel operators said yesterday regarding the prospects for those industries that the outlook in his judgment is good. The mills for the most part are running full, and this situation is expected to continue in the next few months, by which time the crop results will have been determined and many questions now acting in restraint of business will have lost force. He then expects a revival of new orders on a large scale. Meantime, there is little or no demand for light steel rails, and stocks held are extremely moderate. The iron and steel trade is also expected to derive an impetus in the autumn from a relaxation in the international money markets which leading authorities now predict.

Pig Iron and Copper.

There has been a slight backward tendency in refined copper. In fact, the records show that since January there has been a steady decline. A slightly weaker undertone is reported in electrolytic copper, and this has been backed up by European messages. Industrial conditions have been blamed for the drop in copper, both here and abroad. The wire drawers, mills and founders seem to have acted independently owing to the deliveries in copious form which took place during the last few weeks. It is common talk amongst the knowing ones that the big melters will have to worry about the market before the middle of August. Pig iron is not any more active, and the same prices that were in vogue last week now rule. Merchant iron is reported to have had a big "killing" in the States, and most of it was sold to pipe works. This means that there have been big municipal undertakings, hence the big markets get the call. Lead was dull during the week, but well sustained, while tin has shown some falling off, with no sign of picking up. It seems as if the prices have been more or less artificial for some considerable time, and no one has been exactly sure as to what has been going on. The celebrations of the 4th July have been interfering with business in the big country to the South, and it is only natural that Canada should have a taste of the effect. Spelter, antimony and old metals are uninteresting.

Toronto, July 8, 1913.—The Canadian Fairbanks-Morse Co. are doing a rushing business in small pumping outfits for summer cottages, etc., being inundated with orders. There is also a good demand for small size oil engines. Other departments are only fairly busy. Inquiries made by Canadian Machinery among manufacturers of machine tools, boilermakers, etc., elicited replies that varied somewhat in character.

Manufacturers Confident.

One of the largest boilermakers in the country says: "We should pronounce the boiler business good; in fact, especially good in view of prevailing money conditions. Our operations have not been curtailed at all, and at present we have very nearly the amount of work ahead that we had a year and two years ago. Given a bountiful harvest that would inspire confidence, which is as important as money, we see no reason for the coming of a condition of affairs wherein the boiler business would experience any perceptible check." The same note of optimism is sounded by one of the largest tool steel firms in the Dominion. Their representative says:—"Generally speaking, business has been very good, our sales from one store for the first six months of this year being 60 per cent. in excess of those for the same period in 1912. Collections have been slow, and many customers request longer time to make payments. Larger consumers are buying only for immediate needs, and during the last few weeks the situation has been quieter than in the spring." A large Eastern concern says: "Business generally is dull, although we have just received an order that will keep us busy for the next four months.'' Makers of machine tools seem of the opinion that improved conditions will be delayed until the late fall or early in the new year. Most of them are keeping their staffs intact in the hope that the slackness is only temporary.

Pig Iron and Steel.

With the curtailment of business in machine tool and other machinery lines the demand for pig iron falls off. Canadian manufacturers have not lowered their prices, and business is quiet. The poor hay crop in the North, East and West has affected the trade in wire. The price of bale ties has advanced 10c per 100 lbs. Other lines remain the same. At the Canada works of the Steel Co. of Canada, Hamilton, where small goods are made, they are running a night shift. Building operations are fair, and prospects in this sphere look good for the fall, according to the way builders are figuring. The representative of a sheet metal concern reports that while specifications are not coming in so rapidly, he does not find business so very bad.

Metals.

Prices in the metal market remain stationary, and business done is nil. The old material market is weak. There was a reduction in the price of manufactured copper June 30, from 17½c to 17c. for bare copper, and from 18c to 17½c for copper cable, sizes ½ inch to No. 8.

HALIFAX POWER CO. DEVELOPMENTS.

THE Halifax Power Co. is planning to develop two sites on the Indian River, 18 miles west of Halifax. The upper station will include two units of 1,200 k.v.a. each. One operates on 90 ft. head from the Indian River watershed, and the other on 160 ft. head from the North-East River watershed; the latter water is carried over to the Indian River by means of a long pipe line. The lower station will include two units of 1,200 k.v.a. operating on 90 ft. head; in this station the step-up transformers and high-tension gear will be placed.

These developments will render 5,600 h.p. available in Halifax, which will be carried over a duplicate transmission line by two separate routes. Transmission will be at 33,000 volts. It is the intention of the company to sell this power for lighting and industrial requirements in Halifax. Plans are well under way for the upper development, one transmission line and receiving station, and it is expected that this portion of the work will be proceeded with immediately.

NEW TUNNEL UNDER NIAGARA.

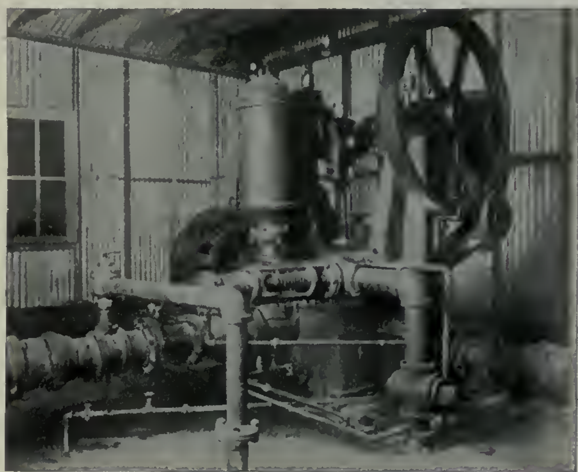
THE engineers of the Ontario Power Company are considering the construction of a tunnel under the bed of the Niagara River, just above the Horseshoe Falls, the object being to provide a new water course for their powerful turbines. At present the turbines are fed from two tunnels, each about 18 feet in diameter, but the ever-increasing demand for power has overtaxed these channels. They are located just under the ground surface, alongside of the street car tracks that go up to Chippewa, and experience has shown that it is not wise to duplicate this construction for future use. One is made of steel, overlaid with concrete, and the other is of reinforced concrete. These are subject to atmospheric changes, and it is on this account that the new location of the other tunnel has been chosen.

The beginning of the new pipe will be at the dam just out from the Dufferin Islands, and it will be carried almost to the brink of the Falls; then it will swing over to the Canadian side, and from here the water will reach the turbine house at the foot of the Falls.

A PUMP WITHOUT AN ATTENDANT.

ONE of the important advantages of the electric motor for driving pumps is illustrated in the installation shown in the accompanying photograph. The pump is situated three miles from the power house it serves, and is started and stopped by an oil switch in the power house. No attendant ever goes near it except to give it a periodical inspection; hence its cost of operation is very low.

If desired, in such an installation, recording instruments can be placed in the power house to indicate how the pump is operating. Such instruments show whether the motor is running normally or not, and if the load is too high or too low, thereby giving notice when something is wrong. The power house attendant can, therefore, give the outfit almost as careful attention as a man on the spot could give. It is convincing testimony, as to the reliability of the motor-driven pump, that such an outfit can be operated for years without trouble of any kind. This installation was made by the Lufkin Electric Light & Power Co., Lufkin, Texas. The pump is a Gould's triplex having a capacity of 350 gallons per minute, and is driven by a 2,200 volt, 50 h.p. Westinghouse motor. It operates against a head of about 130 lbs. and is equipped with a relief valve, so that it can be started against this pressure without injury.



A PUMP WITHOUT AN ATTENDANT.

SAVING ELECTRIC LIGHT BILLS.

MR. F. E. OSGOOD, proprietor of the Osgood Hotel, Cookshire. Que., has devised an interesting means of saving electric light bills, and has had it in operation for several months now.

Like all hotel keepers, Mr. Osgood has experienced trouble with guests going away and leaving the electric lights burning in their rooms. Neither King's English nor good example would induce them to turn the switch off when they left, and to meet the situation, the hotelman had a placard posted in each room, which reads:

To My Guests.

God in His infinite goodness controls all things, but this electric light is now controlled by a meter. Please turn out the light when not in use and forever oblige,

Yours sincerely,

F. E. OSGOOD.

Comment on the unusual placard has been wide, but it has resulted in a material lessening of work for the meter, and a consequent reduction in the electric light bill.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Engineering

Toronto, Ont.—The C.P.R. are contemplating moving their roundhouse from John St. to Runnymede.

Hull, Que.—C. P. R. engineers have been surveying in this vicinity, and it is believed the company will erect some shops here.

Sarnia, Ont.—The Sarnia Fence Co. recently took over the Regal Fence and Gate Co. The latter plant is being doubled in capacity, for the manufacture of more styles of farm fencing.

Ottawa, Ont.—A. H. Coplan & Co., 135-137 Broad St., Ottawa, Ont., manufacturers of iron, brass, aluminum, etc., castings, are contemplating the erection of a large foundry.

Guelph, Ont.—The Page Hersey Iron, Tube & Lead Co., have purchased all the machinery required for their new bedstead tubing plant, and will be running in a few days.

Toronto, Ont.—The C. P. R. will build a one-storey passenger car repair shop on West Toronto Street, near the corner of Keele Street. The building, which will be of brick, will have five lines of tracks, and will cost $26,000.

Hamilton, Ont.—The B. Greening Wire Co., Ltd., mfrs. of wire rope, wire cloth, etc., Hamilton, recently built an extension to their plant for the manufacture of screen cloth for supplying special orders promptly. The machinery will be installed in about a month.

Quebec, Que.—Work will be commenced next week on the N.T.R. car shops. They will be among the finest on the continent and will cost about $1,560,000. The buildings are located so as to allow for future expansion.

Tofield, Alta.—The Tofield Foundry and Machine Co. is now awaiting the arrival of their boilers to begin active work at their plant. The town has given instructions to the G. T. P. to instal the industrial spur as quickly as possible.

Welland, Ont.—Canadian Billings & Spencer Ltd., makers of drop forgings, have recently built a new power house, installed a 5,000-lb. steam drop hammer, and an extra heavy trimming press in the forge shop. In the machine shop they have recently installed a new die sinker.

Ottawa, Ont.—The Flexible Railway Supply Co. of Canada, soon to be incorporated at Ottawa, will erect a plant here to employ 500 men, to manufacture railway supplies. Chas. Forth, Boston, is manager; temporary offices, 340 Queen St., Ottawa.

Lindsay, Ont.—The Cole-Burger Brass Mfg. Co., Toronto, makers of polished brass goods, such as urns, flower pots, etc., will build a plant here, employing 25 men to start, if given a site and a loan of $12,000. Voting will take place on July 24. The new plant will include a foundry, and much stamping, polishing, and finishing machinery will be purchased.

Electrical

Brampton, Ont.—The electric lighting system will be extended.

Goderich, Ont.—The town council contemplates installing a lighting system for parks and bridges. Mayor, C. A. Reid.

Montreal, Que.—The management of the C.P.R. is preparing plans for electrification of its lines within 100 miles of Montreal.

Aurora, Ont.—The ratepayers voted against paying $26.29 for Hydro power, accepting the Toronto & York Radial Co.'s offer at $25.50.

PROBABLE EQUIPMENT REQUIREMENTS

The undernoted firms are now, or likely to be soon in the market for new equipment, etc. For fuller details, reference should be made to the news items:

Machine Tools.

Flexible Rly. Supply Co., of Canada, 340 Queen St., Ottawa, Ont.

The Cole-Burger Brass Mfg. Co., Toronto.

Woodworking Machinery.

Chaudiere Lumber Co., Chaudiere Jct., Que.

Nelson & Foster, Winnipeg, Man.

W. J. Banting, Edgewood, B.C.

J. & W. Duncan, Ltd., Montreal. Que.

Willis Piano Co., Montreal, Que.

Turbo Generators.

Toronto Hydro-Electric Commission.

Steam Boilers.

Toronto Hydro-Electric Commission.

Electrical Supplies.

Hamilton Hydro Board, Hamilton, Ont.

McCuaig Bros. & Co., Montreal, Que.

Town Council, Goderich, Ont.

Town Council, Brampton, Ont.

Macleod, Alta., town council.

Foundry Supplies.

A. H. Coplan & Co., Ottawa, Ont.

The Cole-Burger Brass Mfg. Co., Toronto.

Gas Mains.

National Gas Co., Hamilton, Ont.

Generators.

Toronto Hydro-Electric System, Toronto, Ont.

Railway Contractors' Supplies.

Niagara Falls, Welland and Dunnville Rly., Welland, Ont.

Essex Terminal Rly., Windsor, Ont.

Motor Generators.

Winnipeg Board of Control.

Incinerators.

Hull, Que., city council.

Waterworks Supplies.

Macleod Alta., town council.

Gas Engines.

Berlin, Ont., Light Commission.

Motor Service Truck.

City Commissioners, Saskatoon, Sask.

Sewage Pumping Engines.

Toronto Board of Control.

London, Ont.—The London & Lake Erie Transportation Co. have refitted their old powerhouse, owing to interruptions in the Hydro-Electric service.

Toronto, Ont.—The Toronto Hydro-Electric Power Commission have practically decided to build a $1,000,000 auxiliary steam plant on the water front.

Hamilton, Ont.—Engineer Sifton of the Hydro Board, will purchase arc lamps for city lighting. An arc lamp invented by the American Westinghouse Co is being considered.

Toronto, Ont.—There is talk of the Ontario Hydro-Electric Commission building a second transmission line between Hamilton and Dundas, capable of transmitting 10,000 volts.

Hamilton, Ont.—The Canadian Westinghouse Co. last week supplied another 10,000 k.w. generator to the Canadian Niagara Falls Power Co. It is similar to those previously installed.

Montreal, Que.—McCuaig Bros. & Co., who contemplate the erection of a large generating plant, have interviewed the civic officials of Granby, Que., with the object of disposing of 2,000 horsepower there.

Hamilton, Ont.—Complaint was made to the Board of Control last week by City Engineer Macallum that Hydro-Electric power was off from 3 o'clock until 10 o'clock. There was some discussion as to the best method of furnishing an auxiliary service for the waterworks pumps, and the matter was left in the hands of Controller Cooper.

Berlin, Ont.—The light commission has instructed Superintendent McIntyre to secure an estimate of the cost of changing the old producer gas engine now out of commission to a modern one, and have it connected with electric generators. It is estimated that sufficient power can be developed by this change to operate the street railway service during hydro interruptions.

Montreal, Que.—It was announced this week by Edwin Hanson, president of Montreal Water & Power Co., that the new proposition for sale of St. Henry Plant to the city would be placed in the hands of the city within a day or two. Mr. Hanson explained the delay has been caused by the fact that most of the papers and documents of the company were held in England. It had also been necessary to examine conditions in other cities where plants of this kind were taken over by the corporations.

Municipal

Hull, Que.—The city is considering the purchase of an incinerator. J. A. Laforest, engineer.

Galt, Ont.—The ratepayers have voted in favor of spending $70,000 on a trunk sewer through the heart of the town.

Wetaskiwin, Alta.—The town council are having gas wells drilled to supply fuel for the civic powerhouse.

Bradford, Ont.—The town council will ask the ratepayers to authorize the loan of $20,000 to the Watson-Smith Co., who will build a factory, employing 75 men.

Macleod, Alta.—The ratepayers have sanctioned the expenditure of $46,000 for waterworks and electric light extensions; $36,000 for sewerage construction, $81,000 for filtration plant, and $50,000 for sewerage disposal plant.

General Industrial

Preston, Ont.—The ratepayers have decided to loan money to the Preston Chair Co.

Orangeville, Ont.—The town will lend John N. Dodds, of Alton Village, $30,000 to start a knitting factory.

Vancouver, B.C.—The American Can Co. will build a plant here at a cost of $85,000, tenders for building which have been called.

Wallaceburg, Ont.—The plant of the Hawken Milling Co. was partly destroyed by fire of unknown origin on Saturday morning, July 5.

Prince Rupert, B.C.—W. E. Losee, formerly manager of the cement works at Tod Creek, is arranging for the construction of a new plant on the G.T.P.

St. Catharines, Ont.—The Armstrong Cork Co. will locate outside the city limits in Grantham. It will have fourteen acres of land, and will erect buildings worth $75,000.

Montreal, Que.—The Willis Piano Co. are building a $10,000 plant at Ste. Therese, Que., 3 storeys, 100 x 150. Contractors: James Shearer Co., Montreal.

Dunham, Que.—The Creamery owned by G. F. Masse, of East Berkshire, Vt., was destroyed by fire on July 3, together with machinery and power house. It will be re-built.

Berlin, Ont.—The Beck Duplicator Co., New York, has secured an option on property here for erecting a Canadian branch plant employing 150 hands. H. M. Isaacs, sec.-treas.

Ottawa, Ont.—Plans are to be ready this week for the new elevators which the Government will erect at Moose Jaw and Saskatoon. The cost of each will be $1,000,000, and their capacity will be from 3,000,000 to 4,000,000 bushels.

Prince Albert, Sask.—The city is developing 13,000 h.p. at La Colle Falls, the work being carried out by the Ambursen Dam Co. $1,000,000 is being spent and completion is expected next spring.

Gananoque, Ont.—The ratepayers on July 7 voted in favor of giving a ten year contract, and a 30-year franchise to the electric light company. The Gananoque and Arnprior Railway by-law also passed.

Chatham, Ont.—The Canadian Concrete Products Co. will establish a factory here for the manufacture of concrete culverts, railway signal appliances, concrete posts and similar lines. Work on the factory building will be commenced at once.

Montreal, Que.—The Marine Laundry Co. plant was destroyed by fire Monday and the lumber plant of Geo. Roberts & Co. was gutted. The laundry building was owned by D. Ouimet, and the business by F. E. Ballou, of 2548a Park Ave. The losses are covered by insurance.

Wood-Working

Cobalt, Ont.—The Northern Lumber Mills, Limited, suffered loss by fire recently.

Walton, Ont.—The saw mill of John McDonald was destroyed by fire recently.

Englehart, Ont.—Lafleur's lumber and planing mill at Earlton was destroyed by fire on July 1.

Edgewood, B.C.—A sawmill, planing mill and shingle mill will be erected on the lake shore site adjoining Edgewood, B.C., by W. J. Banting.

Winnipeg, Man.—Nelson & Foster, 1398 Erin street, have obtained a permit for the erection of a sash and door factory at a cost of $5,000.

Thorold, Ont.—The MacCormack Interests, who are completing a new two-machine news-print mill at Thorold, have decided to build a seventy-five-ton sulphite mill immediately.

Chaudiere Jct., Que.—The lumber mill of the Chaudiere Lumber Co. was destroyed by fire on July 2, the loss being $25,000 covered by insurance and Messrs. McCrea, Tobin, Sherbrooke, are interested.

Montreal, Que.— J. & W. Duncan, Ltd., are constructing a new planing mill at their yard, 1833 Ontario street east, Montreal, to replace a mill burned out last fall. It will be constructed on a site 110 x 775.

Building Notes

Red Deer, Alta.—Lang & Major, architects, Calgary, are preparing plans for a new hotel for the Calgary Brewing Co.

Railways—Bridges

Windsor, Ont.—Engineers are laying out a line to Amherstburg through Ojibway. It is thought to be the Essex Terminal Railroad.

Ottawa, Ont.—The contract has now been let for the Le Pas to Port Nelson lines, and 1885 miles of steel will be laid this fall.

Whitby, Ont.—The laying of steel reached Whitby on the new Lake Shore line of the C. P. R. on July 3. This makes a continuous track from Agincourt.

Montreal, Que.—The first motor 'bus of the new type apeared on the city streets on July 1. The 'bus is the output of the Stockwell Motor Co., 626A St. Catherine Street.

St. Andre d'Acton, Que.—Plans and specifications have been prepared for a $8,800 concrete and steel bridge over White River. J. S. Beaudet, secretary-treasurer.

Ottawa, Ont.—The Government are considering a proposal to build a bridge across the narrows connecting Halifax and Dartmouth, N.S. Engineers are now making surveys.

Toronto, Ont.—By the end of the present year a double track will be laid by the C. P. R. from Toronto to Guelph Junction. Next year 189 miles further west will be double-tracked.

Welland, Ont.—Contracts for constructing the Niagara Falls, Welland and Dunnville Railway will be let shortly. The estimated cost will be $600,000. The first section from Niagara Falls will be completed this autumn.

Nanaimo, B. C.—Engineers are at work making plans for the new freight and passenger yards on the E. and N. Railway, one of the C. P. R. subsidiary lines in British Columbia. A new passenger station will be built, the work being started shortly.

Galt, Ont.—Johnson Bros., the general contractors for the construction of the Lake Erie and Northern Railway, have now a huge steam shovel at work excavating at a couple of big cuts, and providing material for a big fill-in to be made just north of the foot bridge, about three miles from Galt.

Ottawa, Ont.—The Cook Construction Co. of Sudbury, Ont., and A. B. Wheaton, of Amherst, are joint contractors for the Halifax Terminal Railway at a contract price of $1,500,000. The line is 5 miles long, and will run from Rockingham to the site of the proposed terminal works. It will be known as the Halifax Terminal Railway.

Quebec, Que.—It is expected that a decision will soon be reached in connection with the proposed new railway bridge over the St. Charles River. An arrangement has been reached between the city and the railways whereby the projected bridge will be so constructed as to permit of general traffic, and the cost will be jointly shared by the city, the Quebec and Lake St. John, Canadian Northern Quebec, and Q. R. L. H. & P. Co. Railways, in addition to the subsidy from the Government. The plans provide for a carriage driveway, footpath for passengers, street cars and railway crossings.

Water-Works

Mount Dennis, Ont.—The ratepayers are urging incorporation to allow them to construct a waterworks system.

Contracts Awarded

Point Claire, Que.—Laurin & Leitch, Montreal, have secured the contract for building the electric lighting plant here.

Eburne, B. C.—R. McLean & Co. have been awarded the contract for installing sewers in Eburne. Their tender was $174,390.

Sarnia, Ont.—The Reid Wrecking Co., Sarnia, have been awarded a contract to raise a dredge which sank off Buffalo harbor recently. The contract price is $17,200.

Kentville, N. S.—Heap & Partners, of Montreal, have been awarded a contract for the supply of almost three miles of steel pipe for the extension of the water works system.

Fort William, Ont.—The contract for the construction of three tunnels for the city's water works has been awarded to the Moran Construction Co., Carleton Place, Ont.

Montreal, Que.—The C.P.R. have awarded the Canadian General Electric Co. the contract for the electrification of their line between Castlegar and Rossland. They will use 2,400 volts and the direct current trolley system.

Montreal, Que.—John S. Metcalf Co., Ltd., Montreal and Chicago, construction engineers, have been awarded the contract for the rebuilding of the Roman Catholic Cathedral at Charlottetown, Prince Edward Island, destroyed by fire some months ago.

Tenders

Ottawa, Ont.—Tenders for a steel pontoon gate lifter, Trent Canal, will be received by L. K. Jones, assisitant Deputy Minister of Railways and Canals, up to July 29.

Winnipeg, Man.—The Board of Control is in the market for a 1,000 K. W. motor generator, tenders for which will be received by M. Peterson, secretary, up to August 9.

Saskatoon, Sask. — Tenders for a motor service truck for the fire department will be received by the chairman of the commissioners up to July 31. F. E. Harrison, Mayor.

Toronto, Ont.—Tenders will be received by registered post by the Board of Control up to July 29 for the supply of portable sewage pumping engines. H. C. Hocken, Mayor.

Ottawa, Ont.—Six tenders have been received for the new government dry dock at Levis, estimated to cost four million dollars. Canadian, British and American firms have submitted proposals, which are now being figured out. The contract will probably be let this week.

Refrigeration

Moose Jaw, Sask.—H. F. Mooers, president of the Moose Jaw Cold Storage Co., is arranging to add an ice making plant.

Toronto, Ont.—H. Arnold has had his meat market equipped with a 6-ton "York" refrigerating plant by the Kent Co., Ltd., Montreal, Que.

Toronto, Ont.—An 8-ton "York" refrigerating plant is being installed in R. R. Bullen's apartment house by the Kent Co., Ltd., Montreal, Que.

Saskatoon, Sask.—The Saskatchewan Abattoirs, Ltd., has been organized and will build an abattoir and cold storage plant to cost about $100,000 or over.

Toronto, Ont.—The Harris Abattoir Co. is adding to its equipment an 18-

ton refrigerating plant, furnished by the Vilter Mfg. Co., Milwaukee, Wis.

Montreal, Que.—The University Club is adding to its equipment a 2-ton refrigerating machine, furnished by the Linde-Canadian Refrigeration Co., Montreal.

Toronto, Ont.—The T. English Co. have had installed in their dairy by the Kent Co., Ltd., a 6-ton vertical, single-acting belt-driven "York" refrigerating plant.

Calgary, Alta.—The Crystal Ice has completed arrangements for the construction of a large ice making plant and artificial ice skating rink, to be erected shortly.

Miscellaneous

St. John's, Nfld.—Five men were killed when a boiler in a new mill at the Alexander Bay Lumbering Co.'s station exploded July 2.

Nova Scotia Steel and Coal Co.—The output of the Nova Scotia Steel & Coal Co. in June was 67,088 tons of coal mined, 47,200 tons of ore mined, and 7,226 tons of iron and 7,147 tons of steel produced.

Alfred J. Jones, Montreal, has been appointed Canadian agent for Hick-Hargreaves & Co., Ltd., of Bolton, Eng., who have commenced the manufacture and sale of Diesel oil burning engines.

New Freight Shed.—The C. P. R. has taken out a building permit at Lethbridge for the construction of a new freight shed, to cost about $20,000, and it is expected that the work will be commenced in a few days.

Engineer wanted.—Applications from candidates qualified to fill the position of engineer for structural steel work in the chief architect's branch of the Department of Public Works, Sub-division A, of the Second Division, Ottawa, at a salary of $1,800 per annum, will be received not later than July 14. Wm. Foran, secretary of the Civil Service

Telegraph Poles for Panama.—The telephone and telegraph poles to be used along the Panama Canal will be cut from Graham Island, British Columbia. J. J. O'Flynn left last week by Grand Trunk Pacific steamer to superintend the work of getting the poles out. They will be put in the water at Sewall, rafted to Prince Rupert, and thence shipped south. The contract, which was obtained by S. D. Sewall and his associates in Vancouver, is for 5,000 poles, and delivery is to be made in September and December.

The American Engine Co., of Bound Brook, N. J., have recently received an order from the Minnesota & Ontario Power Co., of Minneapolis, Minn., for two 500 H.P. four-cylinder variable speed paper mill engines. These engines are to be installed in the new mill of the above company, which is located on the Canadian side of the Rainy River at International Falls. They are designed for a wide range of speed, and are equipped with an improved governing mechanism for giving close regulation, insuring thereby an even thickness of paper. The engines are duplicates of that now being built for the Donnacona Paper Co., of Donnacona, near Quebec.

Pigeon, Pigeon & Davis, patent solicitors, 71A St. James Street, Montreal, report that 152 Canadian patents were issued for the week ending June 17th, 1913, of which 111 were granted to Americans, 22 to Canadians, 14 to residents of foreign countries and 5 to residents of Great Britain and colonies. Of the Canadians, who received patents, 8 were residents of Quebec, 8 of Ontario, 2 of Alberta, 1 of Saskatachewan, 1 of Nova Scotia, 1 of British Columbia and 1 of Manitoba. In the United States for the same week, 636 patents were issued, 9 of which were granted to Canadian inventors.

New Inventions.—The following patents have recently been secured through the agency of Marion & Marion, patent attorneys, Montreal and Washington, D. C. Information concerning them will be supplied free of charge by applying to the above named firm.

Canada.

No. 148,847—Morris Brown, Windsor, N. S.—Double edger stave jointer.

No. 148,879—George R. Hudson, London, England.—Coin counting machine.

No. 148,884—Erich Langguth, Neerpelt, Belgium.—Electromagnetic separator.

No. 148,886—Napoleon Lauziere, Drummondville, Que.—Windmill.

No. 148,890—Henry J. Marks, Toowoomba, Australia.—Cushing spring wheel.

United States.

No. 1,064,085—Messrs. A. Plante and G. Stalport, Montreal, Que.—Disappearing safes and vaults therefor.

Marine

Point Edward, Ont.—The plant of the Point Edward Elevator Co., near Sarnia was destroyed by fire July 7 at a loss of $350,000.

Toronto, Ont.—The R. & O. Navigation Co. have abandoned the $1,000,000 dock project owing to the new viaduct plans for Toronto.

New Westminster, B.C.—Work has begun on the scheme for extending the harbor. Misener and Bailey have the contract for driving piles. The dredge to be used is now on the Mercer ways on Lulu Island.

New Incorporations

Consolidated Brick and Tile Co., Ltd., incorporated at Toronto with $40,000 capital, to manufacture brick, etc., at Toronto. Incorporators: J. H. Flett, etc.

General Power Corporation, Ltd., incorporated at Toronto with $5,000 capital, to manufacture electricity at Toronto. Incorporators: R. W. Hart, G. M. Miller, etc.

P. Burns Coal Mines, Ltd., Calgary, has been incorporated to operate coal, iron, or other mines, $1,000,000; by Patrick Burns, Wilfred Corlet, Frederick S. Albright and others, of Calgary.

International Color & Chemical Co., of Ontario, Ltd., incorporated at Toronto to manufacture paints, etc., at Bridgeburg, Ont. F. R. Humpage, A. S. Rumage, etc., of Buffalo, incorporators.

Canadian Foote Co., Ltd., incorporated at Toronto to deal in concrete and other machinery, at Toronto, with $40,000 capital. Incorporators: F. B. Neeve, J. A. Simpson, etc., Toronto.

Canada Metal Mfg. Co., Ltd., has been incorporated at Ottawa, with a capital of $30,000, to manufacture heating apparatus, ventilating apparatus, and goods of sheet metal, galvanized iron, copper or tin. Incorporators— F. W. Montgomery and John R. Wells, contractors, Boston, Mass., and Lloyd E. Urquhart, etc., of Montreal.

Canadian Abrasive Wheels, Ltd., has been incorporated at Toronto with $500,000 capital to manufacture abrasive machinery, pipe coverings, hardware, etc., at Dundas, Ont. Provisional directors: Harley E. Sherk, Geo. Rr. Harvey, etc. Mr. Harvey is secretary and manager of the Canadian Hart Wheels, Ltd., Hamilton, Ont.

Trade Gossip

The Brown, Boggs Co., Hamilton, Ont., manufacturers of tinsmiths', canners' and heavy sheet metal workers' tools and machines, are now operating their recently built foundry addition.

Big Cheque Forfeited.—A cheque for $75,000 deposited by the Halifax Dredging Co. in connection with the contract for building the Prince Edward Island terminal for the I.C.R. car ferry, has been forfeited to the Government through failure to carry out the work. New tenders are being received.

Personal

W. Warbrick, a representative of the firm of Sir John Jackson, British engineers, is now in Canada on a visit.

P. E. Jarman has been appointed acting chief engineer of the City of Westmount, P.Q., until 31st October, the end of the fiscal year.

W. A. Duff, formerly assistant chief engineer on the W. T. R. has been appointed chief engineer of bridges on the Intercolonial Railway.

John G. Smith, of the Welland Machine & Foundries Co., has invented a clam which he has patented in Canada and the United States.

William Farwell, Sherbrooke, Que., has been elected president of International Coal & Coke Co., in place of A. C. Flumerfelt, Victoria, B.C.

F. N. Trites and R. C. Hodgson have been appointed members of the harbor commission of Greater Vancouver. Another member remains to be elected.

Ernie Johnson, of the machine tool department of Mussens, Limited, has returned from the camp at Petawawa where he had been with his regiment.

A. N. Beer, a Montreal C. P. R. engineer has been recommended for the position of assistant city water works engineer for Ottawa, at a salary of $2,500 a year.

When writing advertisers, kindly mention having seen the ad. in this paper.

The advertiser would like to know where you saw his advertisement—tell him.

J. L. Ross has resigned from the position of treasurer of the Pease Foundry Co., Ltd., Toronto, and is succeeded by R. B. McKinnon, formerly sales manager.

A. C. D. Blanchard, city engineer of Lethbridge, Alta., has resigned. He has held the position for two years. Before accepting another position he will take a trip to Europe.

F. A. Peck, of the Brown Hoisting Machine Co., Dayton, Ohio, was in Montreal last week calling upon the agents for his firm in Canada, Mussens, Limited.

J. W. Orrock, divisional agent for the C.P.R. at North Bay, has been appointed to succeed C. B. Brown in the position of principal assistant engineer of the C.P.R. at Windsor Station, Montreal.

George Moth, travelling engineer for the C.P.R. out of Lethbridge, has been appointed to the position of district master mechanic at Revelstoke. Mr. Moth will be succeeded at Lethbridge by W. J. McQueen, of Moose Jaw.

John Campbell, second vice-president of the Iron Moulders International Union, of Cincinnati, arrived in Montreal, last week in connection with a demand made by 700 moulders, 400 coremakers, and 100 apprentices in Montreal for a nine hour day.

T. P. Pinckard, formerly new business manager of the Peoria Gas & Electric Co., is now secretary of the Dominion Traction & Lighting Co., of Windsor, Ont. A number of years ago, Mr. Pinckard took the engineering apprenticeship course with the Westinghouse Electric & Mfg. Co., and later was in their sales department.

Albert Nuttall, formerly erection superintendent, Structural Steel Co., and for the last two years superintendent of construction in Canada of the Cleveland Bridge Co., has been appointed superintendent of erection, bridge department, Canada Foundry Co., with headquarters at Toronto.

Catalogues

The General Fire Extinguisher Co., Providence, R.I., have issued their July Number of the Grinnel Automatic Sprinkler Bulletin, which contains illustrations of buildings where Grinnel Sprinklers have been installed.

The "Smooth-On" Mfg. Co. have sent us a copy of their new circular, entitled, "Extracts from Smooth-On Instruction Book No. 12." This little booklet, of 16 pages, contains some interesting information with regard to the "Smooth-On" specialties and several illustrations of places where this material has been used. A copy of the circular will be gladly mailed on request.

The National Machinery Co., Tiffin, Ohio, have issued a pamphlet in connection with their exhibit at the recent Master Mechanics and Master Car Builders' Conventions at Atlantic City. It contains illustrations of the National Bolt Cutters, and of operations performed by them during demonstrations at the Conventions. There are also views of the factory.

Buffing Machinery.—We have received from the Webster and Perks Tool Co., Springfield, Ohio, a pamphlet descriptive of their Ball-Bearing Polishing and Buffing Machines. These machines are made in several sizes, a specification being given of each. One of the principal features is that they are fitted with S.F.K. double row self aligning ball bearings. Copies will be gladly sent to interested readers.

Youngs Company, Birmingham, Eng., have sent us a copy of their catalog which is a description of the Ryland patent worm screw Pulley Block. One of the principal features embodied in this Pulley Block, is the self-sustaining lowering and control brake, which allows the speed of lowering to be controlled by the operator. The reading matter is comprehensive and illustrations clear. Copies of this catalog may be had on application.

Pawling & Harnischfeger Co., Milwaukee, have sent us a copy of bulletin 101 describing their "P. & H." single line Grab Buckets. This bucket was originally designed to meet the requirements of the foundry and is so arranged that it can be readily attached or detached from the crane hook. The opening and closing mechanism has been simplified, a second hoisting cable being dispensed with. The bucket is fully described and illustrated. Copies may be had on request.

HINTS TO BUYERS

The advertiser would like to know where you saw his advertisement—tell him.

The Plant and Product of Barkey Bros., Stouffville, Ont.

Staff Article

The following article covers the description of a plant, which, although comparatively small as we look upon many machine shop enterprises these days, yet illustrates how much a business can be built up successfully in an agricultural district where there are no exceptional advantages, such as cheap power and transportation facilities.

BARKEY BROS. established themselves as general machinists at Stouffville, Ont., over seven years ago. Three years later on account of the considerable increase in their business they built their present plant, which consists of a machine shop, 60 ft. x 32 ft.; a blacksmith shop, boiler and engine room, 22 ft. x 22 ft. Above the machine shop, and covering the same area, is the pattern shop, with pattern stores and warehouse. Adjoining the machine shop is the general office.

FIG. 1.—NO. 4 GRINDER.

The machine shop contains a number of modern tools, the principal of these being a 16-inch shaper, an 18-inch screw cutting lathe, and a band saw, all by McGregor, Gourlay, Ltd., Galt, Ont.; a 15-inch screw cutting lathe, a 22-inch vertical drill, by the London Machine Tool Co., London, Ont., and a turret lathe, by Jones & Lamson, Springfield, Vt. They have also installed several machines of their own design and manufacture, one of these being the No. 4 grinder, which is adapted to all kinds of heavy grinding, for car, foundry, machine and plow shops. This machine, Fig. 1, is made for wheels up to 16 inches diameter by $2\frac{1}{2}$ inch thick. The spindle is $1\frac{5}{8}$ inch diameter by 35 inches long. Its bearings are of ample proportion, being $7\frac{1}{2}$ inches long. The height from floor to centre of spindle is 36 inches.

The No. 1 grinder, Fig. 2, is a compact, light machine, suitable for all kinds of fine work, such as grinding tools, cutter knives, etc. The attachment or compound rest shown in the illustration is used when grinding skate blades. The front and back rests are raised or lowered in opposite directions, thereby facilitating the work. Fig. 3 shows a milling machine for nuts, and the hexagons on globe valves. The work is held by a central vertical spindle, screwed at the end and tightened by means of a hand wheel under the bed, the adjacent lever is for moving the work round. The cutters are secured in special spring chucks, and the feed is controlled by the hand wheels shown at the side, attached to the head-stocks. The saddle which carries the work is operated by the hand wheel, shown in front. Barkey Bros. also make a brass finishing lathe, Fig. 4, which does not call for any special mention, except that it is a well designed and useful tool.

Boring Bar Equipment.

Fig. 5 illustrates a boring bar for reboring cylinders of portable engines and valve chambers of Corliss engines.

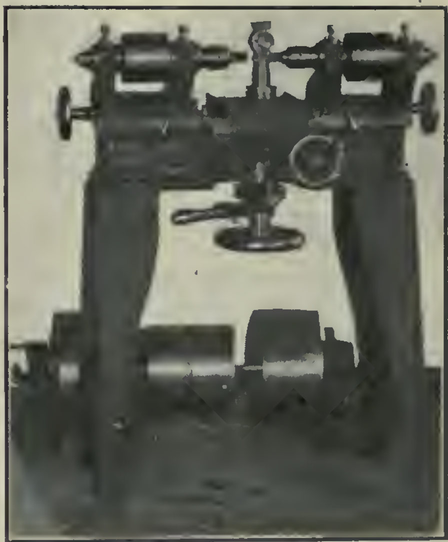


FIG. 3.—MILLING MACHINE.

The chief feature about this device is that it can be fixed to the cylinder and the work done in position, without taking the cylinder down and removing it to a machine shop, thereby causing delay and increasing the cost of the operation. The bar is screwed at one end

CORNER OF MACHINE SHOP.

CORNER OF MACHINE SHOP.

with a fine thread, the other end being turned so that casting (E) is a sliding fit. Both the cutter (C) and handle (D) are secured by means of set screws. A pulley may be used in place of the handle, if power is available.

To re-bore Corliss valve chambers remove the gland and cover, put the bar through at the cover end, until the cutter is in the desired position, adjust collar (B) screwed to suit threads on the spindle so that it rests in the recess of plate (F), which is secured to studs on the cylinder. This plate acts as a stop, and also keeps the bar central. At the cover end, bolt plate (G) to studs on the cylinder, then secure casting (E) to this plate. The casting keeps the bar central and acts as a guide.

When re-boring cylinders of portable engines, the plates (F) and (G) are not needed, as the collar (B) fits into the stuffing box, a brass collar being put in with it, and the gland is put on and tightened up. This arrangement acts as a stop for the bar, and keeps it central. Plate (G) is not required, as casting (E) is made to suit studs on the cylinder. In the former case, it was too short, and the plate (G) was used to avoid making another casting similar to (E). The operation of reboring a thresher engine cylinder takes about three hours. This apparatus is a great time saver, and it has been used extensively on thresher engines, as well as on Corliss valves by the firm.

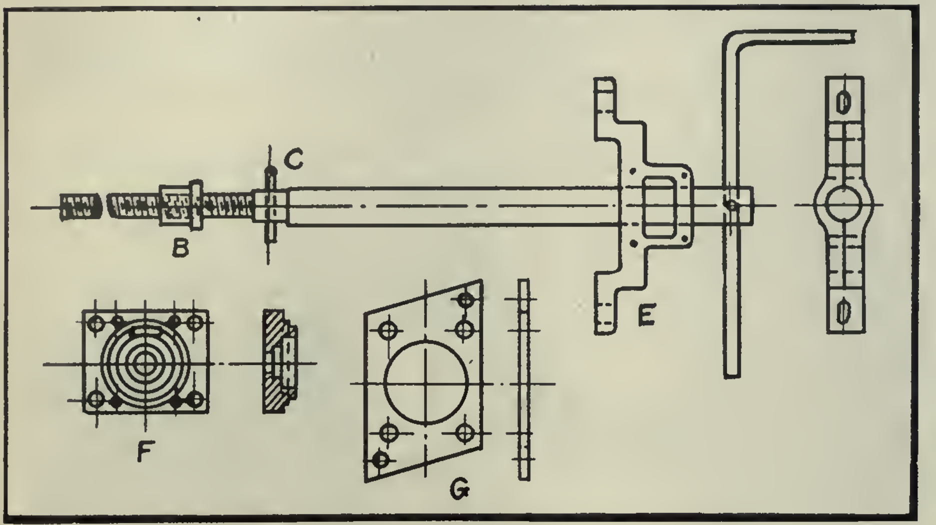


FIG. 5.—BORING BAR DETAIL.

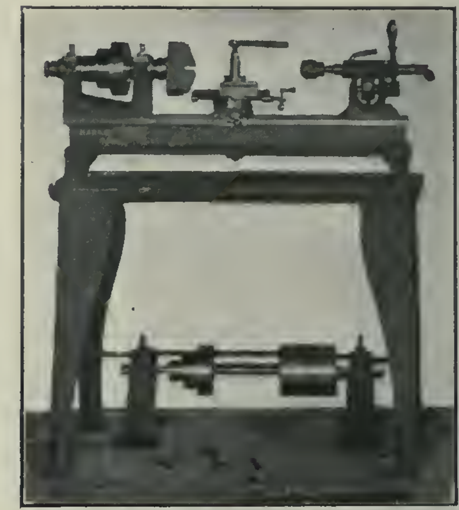


FIG. 4.—BRASS FINISHERS' LATHE.

BIG COAL DISCOVERIES IN NORTHERN ALBERTA.

It is reported that Dr. Reinhold Hoppe of Oakland, Cal., recently located one of the best coal areas in Western Canada on the Smoky River, in Northern Alberta, about 200 miles north-west of Edmonton. The fields are located within 40 miles of the main line of the G.T.P., and experts have reported that the deposits are anthracite and superior to Pennsylvania hard coal. The area, consisting of 32,000 acres, has been leased by Dr. Hoppe and Mr. Paul Isenburg of Honolulu, a wealthy business associate, and they contemplate starting coal mining operations on a large scale. At the last session of Parliament a charter for a line of railway to tap the coal field was secured.

It is said that the customers secured include the German Government, which requires coal for its naval stations on the Pacific. When the Panama Canal is completed, it is expected that large shipments will be made to Germany and other countries via Vancouver and the Canal.

FIG. 2.—NO. 1 GRINDER.

BORING OUT CORLISS VALVE SEAT IN PLACE.

Modern Principles of Machine Shop and Works Design*

Increased attention is being given the design and layout of engineering establishments, the purpose and intent being, of course, the more economical and higher quality production of agiven specialty. The accompanying article is written more particularly from the point of view relative to British engineering plants.

THE lay-out of machine shops must depend on the area, the shape of the ground available, and the nature of the product manufactured by a firm. A ground plan of rectangular from is the best possible, but this is seldom available, except in suburbs clear of other buildings. Where an irregularly shaped piece of land has to be utilized, then some undesirable arrangements are unavoidable; but the aim should always be to avoid handling materials and products more than is absolutely essential. To this end, certain relations of shops to each other, and to railway sidings or canals, will have to be observed, in addition to the internal designs of the shops, the placing of heavy and light machines therein, and the systems of tramlines and dispositions of hoisting machinery. The main problem, therefore, includes much detail that varies with the requirements of different classes of manufacture.

Concentration vs. Isolation.

With respect to the relative positions of shops as affecting the handling of work, two general cases arise. One is concentration in a few buildings, the other, isolation in separate building. To a large degree the choice between these depends on the size of the firm. The larger it is, the more desirable does the isolation of shops, and of departments in shops become, partly because of the necessities of supervision, and partly because of higher specialization. A small firm can have the turnery, machine and fitting shops, all under one roof, in charge of one foreman, while a very large works must not only separate these departments, but must also create subdepartments in each, for light and for heavy work at least. Again, very often further sections must be arranged according to the class of machine used, as planers, drills, gear cutters, grinders and so on. The question then arises whether all these shall be included in one large shop covered by one roof, or be housed in separate buildings or on distinct floors. This can be decided only by each individual firm. Speaking broadly, the present tendency is towards isolation where the work done is of a sufficiently standardized and repetitive character to justify it.

Economy in Handling.

Whatever arrangements are adopted, the cardinal element of economical haulage and handling must not be lost sight of. Raw materials—bars, castings, and forgings—should be taken in, and should with the articles manufactured from them, not return on their tracks, but should progress from shop to shop, or department to department, in orderly sequence. This idea must be uppermost when locating the positions of those departments in which preparatory work has to be done, as the casting, forging, plating departments, and the stores for iron and steel. Raw material should not, as a rule, be transported from one end of the works to the other, but be utilized first nearest the point of debarkation. The cost of transporting a single load is trifling, but the aggregate waste of time and wages in a year becomes enormous.

The same applies to the heavy machine shops into which castings and forgings have to be taken. These should be located nearer to the foundry, smithy, or plating shop than the departments in which light work has to be done. Although these matters may seem obvious to many, they are ignored in some of the older factories, in which the hauling of heavy work over long distances goes on all the while. In view of the enormous quantities of material which have to be transferred from shop to shop in the course of a month or a year, it is clear that the utmost possible facilities should be provided for such transference in order that labor shall not be wasted. This transportation involves the laying down of suitable lines of rails, with turntables where required, and the keeping of all ground floors on the same level, the making of suitable tracks or trolley lines, and the erection of suitable hoisting machinery.

It is well as a rule, when work is for the most part heavy, to conduct operations as far as possible on the ground level. There is, however, always a proportion, greater or less, of light work, and this can well be conducted on upper floors, or in gallieries running round a shop, the latter usually having preference. Upper floors cannot be utilized to the same extent as they are in spinning mills and in light industries in which there is little weight to be elevated and lowered. In shops in which most of the work is light, as in the manufacture of small motors, brass fittings, and articles of similar bulk, floors and lifts can properly be utilized. Lack of light renders fine work difficult on dark days, and runs up the bill for gas or electricity.

The growth of factories in large towns is often so rapid that there comes a limit to the space available for lateral extension. In this way many old firms have become so seriously handicapped that they have cut the Gordian knot by removing out into the suburbs and building a new factory suited to present-day requirements and arranged with a view to further expansion. Some old factories are really nothing b[illegible] [illegible]cient dwelling-houses with partitions between rooms knocked down, retaining the low ceilings, bad light, unsteady floors, and rickety stairs. It becomes difficult for such firms to hold their own against new factories properly laid out, since so little can be done to effect economy in the handling of work.

The modern shop is designed ab initio with a view to the precise requirements either of a business which is already established or of one that is to be developed, and the work of future years is provided for by leaving room for extensions. Instead of building in the heart of a crowded city, most new factories are now erected in the suburbs of cities, or even right out in the country where ground is cheap and room for extension is ample, and where healthful cottage homes can be built for the workmen.

Single-Storey Buildings.

The arrangement of shops on a ground floor only is the modern ideal in factory design, and it is one which is admirably suited for engineers' shops. The work being mostly of a heavy character, its manipulation is awkward on upper floors, but if it can all be dealt with on a ground floor, it can be run in and out, handled with hoists and cranes, while all the trouble of lifting and lowering from upper floors is avoided. Supervision, again, is easier on one floor than on several. A manager or foreman can have more men under more effectual observation, whereas different floors require either extra foremen or divided attention. Hoisting machinery can be more efficiently installed on a ground floor shop than in a storeyed building.

With regard to the buildings themselves, it is better and cheaper to build one-storey shops than those with floors. The walls, having no floors to carry, need not be so thick, and there is no expense for heavy joists, flooring boards, or concrete. More light can be ad-

*From Times Engineering Supplement.

mitted from the roof than from windows in walls, and a north light can be obtained with a saw-tooth roof, which avoids the direct glare of sunshine.

With regard to the walls, in most engineers' shops they are made to fulfill other functions besides that of sustaining the roof. Details which have to be considered are the support of travellers and jib cranes, of main lines of shafting and counter-shafts, and sometimes of machines, such as wall planers, drills, etc., in whole or in part. Brick walls alone are not nearly so suitable for the fulfilment of these functions as are metal columns. This is one cogent reason why columns are generally preferred to brick-work, and it is all in favor of the ground floor shop in which columns take the place of brick walls as supports, the wall often being a mere filling in of a brick course, or even sometimes of sheet iron, between the columns.

Further, the modern shop ideal is to have an unbroken width across two, three, or half a dozen bays. Each bay has its own roof, but the bays are separated only by columns, which leave clear wide spaces across the entire width that is enclosed by the outer walls. The columns, of cast iron, or steel-plated, are made to suit exactly the requirements of the shop, with flanges and brackets to receive the gantries of overhead cranes, the pintles of swinging cranes, bearings for shafting or countershafts, and attachments for wall machines.

In the event of future shop extensions, these bays can be carried out lengthwise by making more identical columns, preserving the uniformity in width and height of the shop. In a well-lighted shop built on this model there is no objection to the erection of galleries of moderate width, provided they do not interfere with the employment of suitable hoisting tackle. They would sometimes block the way of an overhead traveler, but the latter is not required in light departments. Moreover, galleries need not occupy all the length, and they may be raised higher than the crane gantries. Where space is limited, the galleried shops often offer the best solution of a difficulty.

Hoists and Lifts.

Hoisting machinery is a costly item, and one in the laying down of which the best judgment is required. There are so many systems of hoisting adopted now that it is difficult to give statements of general application, but the following considerations should have weight. In the shops themselves, the choice lies between overhead tracks with hoists, overhead travelers, and walking or single-post cranes. The choice of the first two should be favored because they leave an absolutely clear way beneath, but many firms employ the walking cranes, especially in machine shops. Wall cranes will often be needed both for light loads and the local service of heavy machines. Floor trolley tracks are often used. In the yards there should be traveling steam or electric cranes to go wherever required for unloading or loading, for hauling or pushing, in the absence of a yard locomotive.

The hoisting mechanisms for light service which run along the overhead tracks may be divided into two great groups; those which are trolleys only, having eyes from which the actual hoisting machines are suspended, and those that combine the traveling and hoisting tackle in one. The first-named are mostly of the direct lift types, worked by hand, pneumatic, or hydraulic power; the second are electrical. In the hand lifts, pulley blocks are suspended from trolleys pulled along by hand. In the pneumatic and hydraulic types, the movement of a piston or ram in a cylinder is equal to that of the lift. In electrical hoists, tooth gears, drum and wire rope are employed, driven by the motor located on the trolley. The movements of the latter may be controlled from a distance, but more commonly dependent rods with handles are employed, so that the men standing by their loads can operate the hoist from the floor. So extensive are these developments that several firms in England and the United States make a specialty of the fitting of overhead tracks and light hoists for them. For heavy duty, overhead traveling cranes are practically universal. They are made in many styles and powers to suit all conditions, operated from above and from the floor, and, as a rule now, each motion is provided with its own separate motor.

Alternative to the overhead tracks are the walking or single-rail cranes, which have for a long time been favorites in some machine shops. They occupy only the room in which they happen to be engaged for the time being, and the single line of floor and overhead rails does not block the shop much. As they are slewing jib cranes, they cover an area corresponding with the entire sweep of the jib. They were formerly driven by cotton rope chiefly, exceptions being those which have been steam or hand operated, but the electric motor has taken charge of these also, and few of the other types are now likely to be built.

Tramlines.

The question of floor trolley tracks is often difficult of settlement. Where they come into rivalry with overhead tracks is in the handling of work seldom exceeding from one to two tons in weight. The advantage of the overhead system lies in the fact that the floor is left clear. It is not desirable to occupy a shop floor with tramrails where heavy articles are being handled, or where the area available is not ample, or in a small shop or department where the work is all of a very light character. All such areas are best served either with overhead traveling cranes or with overhead tracks with hoists, supplemented, if need be, by swinging cranes to serve heavy machines.

Where small and light work is always being dealt with, the only advantage which tramlines afford is that of bringing in and taking away materials, castings, and forgings, which can be equally well done by overhead tracks without occupying any floor room. The latter have the further advantage that they can be so laid with branch lines as to command practically all the floor area, which cannot be done with tramlines without abstracting too great an area from the floor. In such cases, the ideal arrangement is to run the floor trolley lines up to the entrance of the department or shop, so making connection between it and the outside, but to serve the shop area with overhead tracks. Another objection to tramlines in some shops is the presence of turntables. Speaking generally, the fewer of these the better. They can often be avoided by making connections with curves of large radius and switches.

Racks and Stands.

If disorder and dirt are to be avoided, a free supply of racks and stands must be provided. In too many machine shops, every machine is a focus for litter, the centre of a dumping ground for work waiting to be done, and for the finished pieces, for bolts and angle plates, for templets and tools. Disorder rules; work is covered up and lost, and in dark days the shop is full of stumbling blocks. The provision of racks and stands, and the installation of a tool room are the antidotes to this state of things.

Heating and Ventilation.

Ventilation, except in shops with storeys, is hardly a necessity, because the cubic areas are very large, windows ample, and louvre ventilations are fitted in the roofs, while the employees are scattered. The case is wholly distinct from that of schools, theatres, and place of public assembly, where the conditions are the reverse. Hence, where heating apparatus is installed, it does not usually include provision for changing the air. In hot weather a few electric fans are sufficient for that purpose.

Employees Welfare.

The altruistic side of a works is not neglected in shops that are built now. Formerly a mess room was generally included in shops of any pretensions, but it was generally a bare chilly place, with deal forms and tables, with no provision for cooking other than that which could be done by the men themselves at a common stove or hot plate. Small shops had not even this provision. Not one shop in a hundred had any provision for washing; comparatively few have yet. Washing hands before leaving work was nearly always discountenanced, and absolutely prohibited in some shop rules. As to baths and facilities for change of apparel, the idea would have been generally scouted only half a dozen years ago. In the best shops now, every man has his seat in the dining room, a wash basin, and a reserved and numbered locker. In some a regular kitchen and chef are provided, and the men are supplied with properly cooked meals and various drinks at cost price.

Plant and Product of the C. A. Dunham Co., Ltd., Toronto

Staff Article

The contents of this article go to show that it is possible to lay out comparatively small manufacturing plants, and provide not only the latest and most modern production facilities, but at the same time have installed and in operation appliances and schemes which contribute to the welfare and contentment of the employees.

WHAT a difference there is between a well managed plant and one which lacks system! In the first there is smoothness of motion, no running of employees hither and thither, no groups of men gossiping when they should be working. There is an air of perfection about the plant that one hardly associates with a machine shop. Then look at the other; it is just the reverse — dirty, noisy, unsystematic, with parts of machinery lying higgledy-piggledy on the floor, and chaos reigning. It is the American, perhaps, who has seen first the value of order, smoothness and system, and it is the intention of the writer to draw attention to a plant situated in West Toronto, which is a paragon among machine shops of its kind. It is the Canadian branch of the C. A. Dunham Co., Ltd., makers of the Dunham radiator steam trap, the parent plant being at Marshalltown, Iowa.

It is two storeys high, the ground floor being used as a machine shop, and the upper for an office, engineering department, shipping room, etc., though before long the office will be housed in a new building, separate from the works. The upper storey is really a gallery or balcony, occupying two sides, while the centre is open from the machine shop to the glass roof.

On entering at the door, what do we see? First, the floor is composed of large squares of cement, and is clean. To the right is the machine shop, the cast iron department on one side, and the brass on the other. Directly in front is an iron staircase leading to the second floor, but, half-way up, there is a turn, and here the stair broadens out into a platform holding the desk of the shop superintendent. From this observation platform he can see every machine and every man on the floor below. More than that, if he turns around he can see the workmen upstairs, being situated just a few feet lower than they; and he also sees every person who enters the building. He has a desk, with a phone and filing cabinet.

Directly beneath the platform, in a corner, is a sanitary water fountain, kept continually running. This is something new in a machine shop. Its white porcelain bowl looks clean, and the water is cooling.

There are lots of people who claim that it needs a great big plant before it pays to introduce a system; but here is a plant, the product of which is small, and yet it runs on system. On the right of the staircase is a hand-power elevator connecting the two floors, made by the Otis Elevator Co., Toronto, Ont., measuring 3 x 3 feet. When the castings are wheeled in on the truck, instead of being carried by hand upstairs, the truck is pushed onto the elevator. A boy will operate it, and having seen the truck safely on the second floor, climbs the stairs himself. The elevator costs little and eliminates all the running up

VIEW SHOWING SUPERINTENDENT'S PLATFORM WITH ELEVATOR ON THE RIGHT.

and down stairs which the firm had to endure in pre-elevator days.

When supplies are required, the truck is wheeled out again, the castings being in trays, of which there are several. These are pushed to the machine and the operator machines them. Then they are wheeled to the next machine, and so on. The reader will see at once what an inestimable boon the elevator is in a small plant of this description. The plant was built with a view to giving the highest efficiency, giving a smooth flow of material from the time of its arrival in its rough state, to the hour when it is tested and shipped. This perfection is attained easily with the aid of the elevator, which makes the passage of parts from one department to another a simple matter. Incidentally, the truck on which the trays are loaded is the exact size of the elevator floor.

In the case of an institution so clocklike in its movements, there must, naturally, be other features which are worthy of emulation. The manager, Mr. Dickie, was showing the writer into the room for making copper discs—one of the patents on the Dunham steam trap. "Now this is the heart of the works," said Mr. Dickie, as he unlocked the wire door leading into this department. "And so you lock the door," the writer remarked. He stopped to explain that the frail wire doors and partitions had a good moral effect on the men. "They are not locked in," he said. "See, it can be opened from the inside, but not from the outside. And the man who opens that door and leaves the room must have a mission. Prior to the introduction of this system the men could wander from one department to another without any compunction. It has been wonderfully successful."

A peep into Dunham's washroom and lavatory on the ground floor will reveal the twentieth century method of providing workmen with comfort. The writer knows of plants whose washrooms would drive a man home in his grime, and which, in the daytime, to say the least, were revolting. This one is equipped with large, deep individual earthenware wash bowls, supplied with hot and cold water—the type that tempt you to stop and take a dip. The room has a cement floor, is spotlessly clean, and the air is as pure as in the main shop. This is effected by a ventilating system, which draws all impure air through pipes, and induces a current of pure, cool air. On the floor in the corner is a box with brushes and shoe polish—not much, it is true, but it tends to give Dunham's men an unusually clean appearance as they leave the works. There is also a large mirror, and a cabinet containing brushes and combs. If all factories were run on these lines, how much brighter would be the lives of Canadian workmen.

C. A. DUNHAM CO. PLANT AT TORONTO JUNCTION.

Here is another feature which must have a passing reference. Outside, near the entrance to the building, stands a temporary boiler house, containing a 60 h.p. boiler built at Polson's Iron Works, with a chamber for coal. Steam is generated for heating purposes, and for testing the steam traps. Entrance to this can be gained through a door under the superintendent's platform. Several steps lead to a tunnel, which connects the main building with the boiler house. Its dimensions are 4 x 6 feet, and are sufficient to allow one to walk through erect. It contains a pump for the vacuum heating system, motor driven, with an automatic electric control. This tunnel, which is built of concrete, carries the steam and water pipes, as well as the electric wires. Next summer, when the plant is extended, the boiler house will be moved further away, necessitating lengthening the tunnel. Then it will be more useful for carrying wires and pipes.

Whenever an engineering firm can afford, and can find time to cut the grass in front of the office, and grow a few flowers, it is a ten to one bet that they look well after employees in other respects. At Marshalltown, Iowa, U.S.A., the Dunham plant is a beauty spot, and so the Toronto plant will be as soon as the extensions are completed. The gardens are already being arranged.

This is a plant of surprises. The opening of a door will reveal a new department of the existence of which there was no suspicion. Each man is attending to his own work, and that is why this firm turns out 20,000 steam traps a year, with so little ostentation. On the right of the superintendent's gallery is a door leading to the grinding, buffing and polishing department, the equipment in which is to be increased. The castings come in here to be ground

A CORNER OF THE PLANT UPSTAIRS, WHICH IS SERVED BY THE ELEVATOR.

—the first operation—and return afterwards to be polished.

This room leads to another of similar size, now being used as a blue-printing department, which contains a blue-printing machine by the Buckeye Engine Co., Salem, Ohio. When the engineering department is moved into the new office building this room will be equipped as a nickel-plating department.

A word about the machine shop. But for the grinding room and washroom, it occupies the whole of the ground floor. There are electric motor drives aggregating 25 h.p., the Toronto Electric Light Co. supplying the power. All line shafting is equipped with Chapman ball bearings, which tend to give the plant that perfectly smooth characteristic previously referred to.

On the left are four automatic brass turret lathes, made by the Warner and Swasey Co., Cleveland, and one by Bardons and Oliver, Cleveland. There is a power punch, for forming and stamping the disc used inside the steam traps, made by the Niagara Machine and Tool Works, Buffalo, N.Y.; a milling machine, and a tool lathe, both by LeBlond; a No. 3½ Greenerd arbor press, a turret lathe for cast iron work, by the Warner and Swasey Co., Cleveland, and a drill press by the Sibley Machine Tool Co., South Bend, Ind.

After passing the superintendent's gallery, climbing the stairs, one comes at once to the testing laboratory, consisting of a standard radiator of 50 sq. ft., fitted with thermometer and mercury pressure tube, with connections to tanks for collecting water which passes the traps. Steam is admitted to the radiator at a pressure generally used in radiators, and after a time the water condensed is weighed, and the percentage of steam wasted in the trap figured out. There is other apparatus for testing all the heating specialties made by this firm.

On the left is the assembling department, so that traps, as soon as made, are right near to the testing laboratory.

On the extreme right is the department for making copper discs. The disc in a trap allows condensed water to drain from a radiator, but steam will expand it, closing the exit for water. It contains a liquid, which is a Dunham secret.

The building is lighted, so that the superintendent from his platform is able to switch on a single lamp in any part of the building.

ANTICIPATION.

By Paul Lupke.

THIS is a short talk, intended principally for the primary class—the boys we left behind us—to whom youth still holds out the precious privilege to anticipate, also, incidentally, for their elders.

When we were young enthusiasts, industriously composing essays at school, the one particular subject under treatment was always the most important thing in the world. Now, when the sobriety of riper years has developed a keener sense of proportion, we wisely shun superlatives, yet, even so, I venture to assert that anticipation is the accomplishment that contributes most to success in life.

Said a grammar school principal recently, relying upon a lifetime's solid experience: "We are a nation of 'Sixth Graders,' because a big majority of us never went beyond the sixth grade in school. Some of us couldn't, but most of us wouldn't; and to those who really couldn't, let us extend sympathy and help whenever and wherever we can. Just here, I am concerned with those who wouldn't. They give up because they do not anticipate the value of an education beyond the sixth grade.

Wanted to Fire a Boiler.

Asking a young fellow who had every opportunity to acquire a good education why he left school, I got this answer: "There is too much 'Lady of the Lake' in that course for me; I want to fire a boiler." Do you realize how large and difficult a problem that boy compressed in that one sentence? The question of proper home influence, the need of congenial courses, of teachers of strong personality are all unconsciously expressed in it, if we could sound it to the bottom. Surely the burning ambition to fire a boiler is most laudable, and failure to appreciate an intimate acquaintance with the "Lady of the Lake" may prove no great handicap for the young man; nevertheless, if he had stuck to his lessons a while longer, his chances of eventually owning the boiler instead of being obliged to shovel coal into its furnaces indefinitely would have been materially increased.

Alas, youth and inexperience are almost synonymous, and, without the sting of experience, we seldom appreciate a lesson—there's the rub. All that we, who have the experience and lost our youth gaining it, can do is to impress the lesson we learned at such enormous cost upon our boys. The least that fathers who wouldn't, and now are sorry for it, should do, is to try to get it into the heads of their boys "who won't" that they are dead wrong, and, if necessary, emphasize the lesson, according to the precept of a lost art, on another part of their anatomy. If you do succeed in curbing the eagerness of your boy to be out and at it until he is armed with the keen weapons of theory to tackle hard practise, watch the bent of his mind, and give him every possible chance to find out for himself what he really wants to do.

Lucky indeed is the youth who finds his proper place when he enters the ranks; to put it plainly, who gets the job that fits him, the job that fills his heart's desire and his soul's yearning. There is just one such job for each, and that is the job worth watching, waiting and working for; it is the only job in which he can expect true success. Indifference and indolence of parents and the lure of the immediate dollar drive many a boy into a life of stubborn listlessness and stagnancy.

The Misfit.

My boss says: "The man who cannot do his stunt with a smile on his face I won't have in my organization; he sours the whole dough." My boss is right, and the man who has not found his proper place is bound to be just that kind of an undesirable citizen. If a young man feels the sentiment growing upon him that the business he is in is rotten, he surely will rot in it if he doesn't get out in time. He will settle down to eking out his eight hours of work by the stop watch and hatch grievances the rest of his time, and that will be the end of his growth. He may in due time exact a few additional cents for each one of those eight hours by the joint application of the old testament method of "an eye for an eye, etc.," but he will be a paid-by-the-hour man for the rest of his life. Never may he pop his head above the deadline of the general average without getting a brotherly whack on it, while all the world is watching and eagerly waiting for those who dare push their way through the crowd and come ahead.

The Thrift Feature.

Next, when you have your job, watch your pennies. Perhaps you only just get along on what you earn—well do it, but when the first raise comes, get on a little while longer just as you did before and save the difference. That gives you your chance—your only chance—to get ahead of the game. Once you start to save, you will soon get the habit and then you are safely on the right road. Keep a weather-eye on your little pile. Shun the hungry horde of installment vendors of trumpery trash that hang on the paymaster's trail like a pack of coyotes. Be deaf, dumb and blind to all the allurements of Florida orange groves, Colorado gold mines, Jersey shore lots and Mexican rubber plantations. Make your money work, but give it a job at home that you can watch and best of all, give it a job in the business your own efforts can help to improve.

Many of our companies have grown real souls of late, and are stretching forth a helping hand honestly to all those who show the slightest disposition to help themselves. One company recently offered its employees stock on a very liberal and equitable basis. Some came in on the deal, more did not. I asked the men why they did not. "I bought a house, and every cent I can spare goes to cut down the mortgage," said one. "My wife is ailing and the doctor and the druggist keep me strapped," said a second. Both valid reasons. "Oh, it's only another scheme to get us tied down good and fast," said a third and more. Now these poisonous microbes of mistrust—but no, that is quite another story.

Here is what a young fellow said: "Why, man, it takes seven years to pay for that stock. Who on earth would bother with a waiting game like that? I have better use for my cash right now;" but had he? He was giving a demonstration right then and there, for he was delivering his harangue from the brass-tacked throne in a mirrored shoeshining parlor, enveloped in a halo of cigarette smoke, while two little Greek boys were slapping their rags across his shining tans with the enthusiasm inspired by the anticipation of a liberal tip. Five cents a day would have paid for a share of that stock. Shining his own shoes and cutting out a pack of cigarettes would have paid for several, and oh, how short those seven years will be when that young fellow gets his chance to look at them from the other end!

Youth the Anticipation Time.

Youth is the time to anticipate. To youth the years are long, but they gather speed like a falling stone. Opportunities do not happen, they are made, and the time to make them is while you are young. In youth, the foundations must be laid for that kind of a life upon which age can look back without regret. That is success. Mere accumulation of money is not success, but the acquisition of so much of it as is necessary to provide for your family and your own old age, nevertheless, is an essential part of success, and without that part, only the exceptional few endowed with genius have ever been called successful.

In conclusion, let me anticipate the fate of this little screed. Some of you may think it worth a momentary clap or two, and when it comes to you later, embalmed among the meaty matter of the Proceedings, some may give it a casual look to the end where it will probably say: "There being no discussion and the luncheon hour being long past due we will now adjourn." Then it will be placed on the shelf to gather dust in peace. Still, some time, somewhere, some young chap—and be he but a meandering office boy—may happen across it and catch an inkling of its true meaning that will help him anticipate in time to set the trend of his mind toward the right road to success.—From an address delivered before the recent National Electrical Association Convention at Chicago.

The Theory and Practice of Screw Cutting on the Lathe

By J. Davies

The author of this series of articles intimates his intention of making the information sufficiently simple and clear, that apprentices and others will put the four rules of arithmetic at their command will be able to intelligently grasp the data and apply it in practice.

THE theory part of this series of articles was approved by the Government Inspector, and taught to the apprentices of the Towea Engineering Co., Whitehaven. The practical part of it, that is, the actual operation of the lathe, is the result of experiment and experience combined, and found highly successful in workshop practice. If any point be not made quite clear, the writer will reply to any inquiry addressed to the Editor, Canadian Machinery.

Finding Wheels.

Put down pitch of thread to be cut in form of fraction, the pitch of a thread being the distance from the centre of one thread to the centre of the next.

In a square thread it can be more conveniently measured from the edge of one thread to the edge of the next. Care must be taken however, in measuring the pitch of a thread that we wish to replace. Ascertain first, therefore, whether it is an ordinary single thread, a double, or perhaps triple thread, by taking the point of a pencil or scriber and running it round the thread for one revolution. This will tell you at once what kind of a thread you are up against, and whether it is right or left hand. I have known men measure up a thread without taking this precaution, and find to their dismay when they have the job nearly finished that they have been cutting a single thread when it should have been a double one. This is most likely to occur in cutting an internal thread, as the angle of the thread which indicates a double or treble thread cannot be noticed so readily inside a nut.

A very easy way to express the pitch of any given thread is to draw an horizontal line thus ———— and place the number of inches above the line and the number of threads below the line; the resulting fraction will always be the pitch of the thread.

Example pitch of 6 threads per in.=

$$\frac{\text{Inches } 1}{\text{Threads } 6} = 1\text{-}6 \text{ Pitch.}$$

Apply this rule to all simple threads.

In cases where there is a fractional number, multiply both inches and threads by the least number that will make them both a whole number.

Example—Find pitch of 6 1-4 threads per inch.

$$\frac{\text{Inches } 1}{\text{Threads } 6\frac{1}{4}} \times 4 = \frac{4}{25} \text{ Pitch.}$$

Example—Find pitch of 3 2-3 threads in $1\frac{3}{4}$ inches.

$$\frac{\text{Inches } 1\frac{3}{4}}{\text{Threads } 3\ 2\text{-}3} \times 12 = \frac{21}{44} \text{ Pitch.}$$

If the pitch is given is given in decimals, bring it to a fraction by placing cyphers under each decimal figure and 1 under the decimal point thus:

$$.75 = \frac{.75}{100} \text{ or } 3\text{-}4 \text{ and so on.}$$

If given on the blue print in French measurement or millimetres, reduce to a vulgar fraction 25.4 millimetres=1 inch, which is near enough for any practical purpose, therefore 1 millimetre=5-127 of an inch. Keep the 5-127 in mind as the equivalent of 1 millimetre, then multiplying by the number of millimetres, will give the pitch of thread required.

Suppose you were required to cut a pitch of 7 millimetres per in., then the pitch in the form of a fraction would be

$$\frac{5}{127} \times \frac{7}{1} = \frac{35}{127}$$

Having found pitch of screw to be cut, find pitch of leading screw in the same way. The whole principle of gearing up a lathe for screw-cutting is one of ratio or proportion. Suppose thread to be cut is the same as leading screw, then it is evident that the job must make the same number of revolutions in the same time as the leading screw. The ratio of driving and driven wheels must be the same as the ratio of the screw to be cut with lead screw.

To find ratio, multiply pitch of screw to be cut by the inverted pitch of the guide screw.

Example pitch of screw to be cut 1-4.
Pitch of leading or guide screw 1-4.
Find ratio.

Invert pitch of leading screw and multiply

$$\frac{1}{4} \times \frac{4}{1} = \frac{4}{4} \text{ Ratio}$$

THE LOOSE NUT IN AN ELECTRIC SYSTEM.

By S. W. Worrall, M.Sc., M.E.

IT was recently remarked in the lay press that London could be thrown into darkness by a loose nut. While this in itself is rather an exaggerated statement, it is true that a loose nut may account for a great deal of trouble in an electric system. A case in point has recently come before the Vulcan Co., Manchester, England.

At a certain textile mill driven by three induction motors of the slip ring type, the power is supplied by a three-phase alternator, and the motors form the entire load. The largest motor, which is 175 h.p., gave considerable trouble at various times; at one time several rotor bars burnt out, while at another time the rotor bands were reported slack. These faults were repaired, and all went well until recently, when the trouble developed in a new way. The motor began to hunt on full load, and being the largest on the system, caused the pressure to fluctuate so violently that the no-volt release on the switch was liable to operate and cut the power off the motor. The other motors were also affected, and the entire mill was sometimes brought to a standstill. The only evidence that the large motor was the cause of the trouble was that, when it was not running, everything was quite normal. On half load the fluctuation was less violent and the mill could be kept running.

As the rotor had given trouble before, it was naturally assumed that something had again gone wrong with this part of the motor, and the makers were accordingly called in. The engineer sent could discover nothing wrong, and a second engineer attended. He carefully examined every part, tightened up and adjusted all the contacts and cables, and although he did not locate the seat of the trouble, the fault apparently disappeared. A few hours after he left, however, the fault again came into evidence, and as the motor was insured with the Vulcan Co., an urgent telegram was despatched by the owners of the mill requesting a special engineer to be sent.

Trouble Located.

When the Vulcan Co.'s engineer reached the mill the motor was running on half load, and, without stopping it, a series of observations was made, which showed that the trouble was due to a high resistance in one phase of the rotor circuit. Step by step the fault was traced out, and eventually located to one of the running contacts of the rotor starting switch. The motor was not stopped, but was enabled to take full load by a temporary connection across the three rotor leads, thereby cutting out the starting switch altogether.

During the breakfast hour the slate front of the starting switch was drawn forward, and the suspected connection examined. The nut was found to be quite tight, and only very slight signs of overheating were visible. This connection had previously heated up, but at the time was quite cool.

Faulty Contact.

The observations made, however, left no doubt that the contact was at fault, and as the nuts would not yield to the spanner, they were driven off by hammer and chisel. The contact surfaces were so fused and oxidised that the circuit was practically broken, and the rotor was, therefore, running on two phases instead of three. A new part was made at a local brass foundry, and when fitted the motor took full load in a perfectly normal manner. The actual work was done in the meal hours, and during the working hours the mill was kept running on full load by the temporary connection described above. The faulty contact was very difficult of access, and could not be inspected without dismantling the switch. The screwed stud was about one-quarter inch too short, and the last nut was on the stud for only half its thickness, while the condition of the thread suggested that the nut had been first put on with the threads crossed, thereby becoming tight on the stud without making the contacts secure. If this be the correct explanation, the cause of the trouble had been present from the first, but until overheating was set up, with consequent oxidation and arcing of the contacts, no trouble was experienced.

A similar case occurred at another mill some little time ago; the speed variation being so bad that the quality of the manufactured product was seriously impaired. This time the trouble was caused by loose brushes on the contact arms of the rotor switch, and when these were tightened up the motor ran in a perfectly normal manner. The writer of the article is a member of the Vulcan Co. staff.

IMPROVING NOISY GEARING.

IN some of the large shops in St. Petersburg a simple method of lessening the noise of gearing has been found successful. For gears of less than 18 in. diameter, two sheets of tin are fitted, one on each side of the wheel, so as to box in the space between the rim and the boss, the sheets being screwed to the rim. The space between the sheets is filled with sawdust and No. 4 shot, to eliminate vibration. When the diameter of the gears is greater than 18 in., wooden rings are used instead of tin, attached in the same manner. A felt packing is used to prevent the sawdust leaking out. This arrangement reduces the amount of noise produced by the gearing, and by closing the spaces between the spokes of the whee lmakes it impossible for a workman to get his arms or tools caught.

STRONG SOLUTIONS FOR ELECTRO-GALVANIZING.

THE zinc salt employed almost exclusively for electro-galvanizing is the sulphate. This is the cheapest of any salt that can be used for the purpose. The only other modification employed for the electro-deposition of zinc is a cyanide solution which is now and then used, although rarely, in instances where the sulphate cannot be employed.

Zinc sulphate occurs in commerce in the form of fine, white needle-shaped crystals. These crystals contain 43.90 per cent. of water in the form of "water of crystallization." When standing in the air, the water is gradually given off, and dry sulphate of zinc remains. The dry sulphate of zinc, therefore, contains a far greater amount of zinc than the crystallized salt for the reason that its water is being lost, which, of course, increases the zinc percentage. The amount of zinc in the crystallized and dry salts is as follows:

Crystallized Zinc Sulphate. 22.64% Zinc
Dry Zinc Sulphate........ 40.37% Zinc

It has been found that the best results are obtained if a solution of zinc sulphate used for electro-galvanizing is well concentrated. It then "throws" better, and the zinc deposits more rapidly with a given voltage on account of the increased conductivity. It will be appreciated, therefore, that if a formula is given for making up an electro-galvanizing solution with zinc sulphate, and the crystallized salt is used, then it will not be the same if the dry salt is employed. It will then contain nearly twice as much zinc. In other words, uniform results cannot be obtained unless the same strength of solution is used, but this can be determined by the use of a hydrometer. It should be known that the crystallized salt, upon exposure to the air, gradually loses its water and becomes converted into the dry sulphate.

The old formula for electro-galvanizing, which calls for 2 lbs. of zinc sulphate dissolved in 1 gallon of water, is insufficient for some purposes, and it is advisable to use a stronger bath. It will, of course, answer if the dry salt is used, but this is not obtained in commerce for the reason that manufacturers of zinc sulphate always desire to sell as much water as possible. It has been found that a solution containing 4 lbs. of the crystallized salt to a gallon of water is preferable. The use of sal-ammoniac for increasing the conductivity and causing the anodes to dissolve more readily is advisable. Some aluminum suphate for producing a smooth deposit should also be employed. The following proportions are recommended:

Water	1 gallon
Zinc Sulphate (crystals).....	4 lbs.
Sal-ammoniac	2 oz.
Aluminum Sulphate	4 oz.

This solution will stand between 30 and 40 degrees Beaumé. The sal-ammoniac and the aluminum sulphate should be dissolved in a small quantity of water (preferably hot) and then added to the zinc sulphate solution. If added directly to it, they do not dissolve as readily on account of its concentration. This solution can be used with a low voltage, on account of its high conductivity. From 1 to 2 volts are suitable for the electro-deposition of the zinc. It is used cold. If the zinc sulphate has become dry from standing in the air, then the solution can be made up by adding a less quantity and testing with the hydrometer.

The zinc deposit should be white and smooth, and form rapidly. It will be found that the solution will "throw" into deep places much better than one that is weaker. Some platers have been known to use a saturated solution of zinc sulphate so that some of the salt remains undissolved in the bottom of the tank, but this condition is apt to coat the anodes over if there is a drop in temperature. With 4 lbs. of zinc to the gallon, the solution is very nearly saturated.

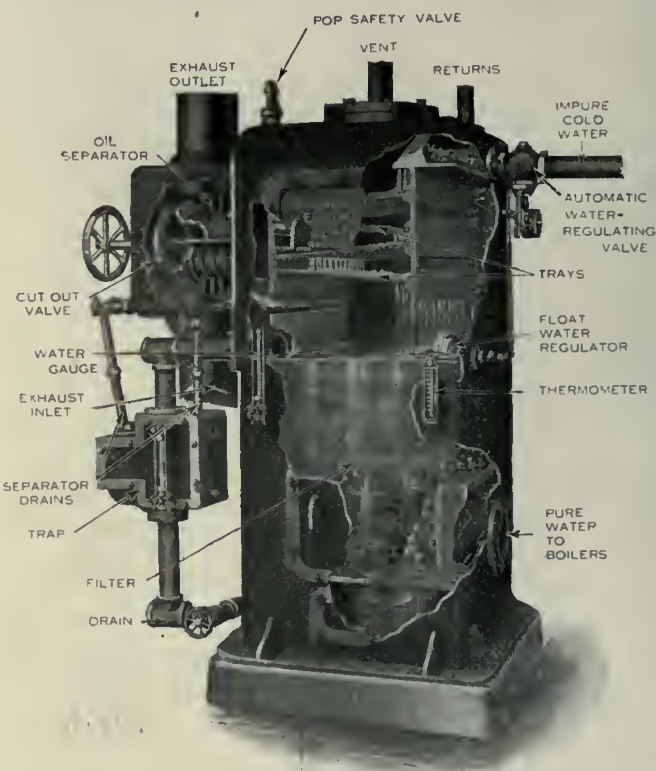
Bear in Mind that good engineering practice is grounded upon sound theory; and thus remembering, never derogate the fellow whose attainments are strongly theoretical

NEW ONE-PIECE HEATER.

THE Bates Machine Co., Joliet, Ill., have placed on the market a new type Cookson one-piece heater. The substitution of a single casting for the customary built-up plate body does away with bolts and caulked joints at all points save the oil separator, the manhole and handhole covers, and the pipe fittings. In other words, there is no chance for leakage at the points which in any built-up heater are most apt to give trouble from this source. It is evident, too, that the more solid construction is practically indestructible and capable of safety withstanding the greatest back pressure that might ever build up within the heater. The steam space, tray surface and filtering space are large, and four large manholes and handholes make cleaning easy. The cleaning doors are conveniently located in front and back, and as the heater may be made right or left hand, by turning half way round, it will fit into the plant without complications in the piping.

The oil separator is made in either of two types:

(1)—Extra large and with cut-out valve, so that all the exhaust is treated.



NEW ONE PIECE HEATER.

The surplus over feed water heating requirements is, therefore, in best possible condition for re-use in heating or precessing systems, while the cut-out valve permits shutting off the body of the heater for cleaning, without interfering with the action of the oil separator.

(II)—Standard oil separator which permits piping of the heater on thoroughfare or induction principle, and insures oil elimination from as much exhaust as is required for feed water heating.

A steam trap and return openings are provided so that the heater may receive the returns from a steam heating system or otherwise, as desired. The fittings throughout are high grade, and the flanges are furnished to meet customer's requirements.

It is Very Possible that through the development of this ancient device—the steam turbine—we may yet see the nearest approximation to ideal thermodynamic and mechanical efficiency in the group of heat motors, that man can attain.—Dr. Thurston.

INFORMATION FOR INVENTORS.

Pigeon, Pigeon & Davis, patent solicitors, Montreal, report that 126 Canadian Patents were issued for the week ending June 24th, 1913, of which 85 were granted to Americans; 19 to Canadians; 13 to residents of Great Britain and Colonies; and 9 to residents of Foreign countries. Of the Canadians who received Patents, 8 were residents of Ontario; 5 of Nova Scotia; 3 of Saskatchewan; 2 of British Columbia; and 1 of Quebec. In the United States for the same week 580 patents were issued, of which five were granted to Canadian inventors.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

SECTIONAL DIE.

By A. L. Mourad.

WHEN a toolmaker travels from place to place, he notes the different methods used in manufacturing the products of practically the same class of work. Because of the different styles of presses used, one type of press being inclined, while another may be vertical, a punch and die must be designed accordingly.

The drawing shows a very simple sectional punch and die for punching oval washers of .016 inch sheet copper used in armature cores. The same design can also be used for light metal of any description and of different forms. The punch and die are shown separate and in plan and cross section of its centres. The blank must be manufactured very accurately and interchangeable. It is parallel and rounded on both ends; also duplicated by reversing it, either end or sides. The holes also are perforated in exactly the right location.

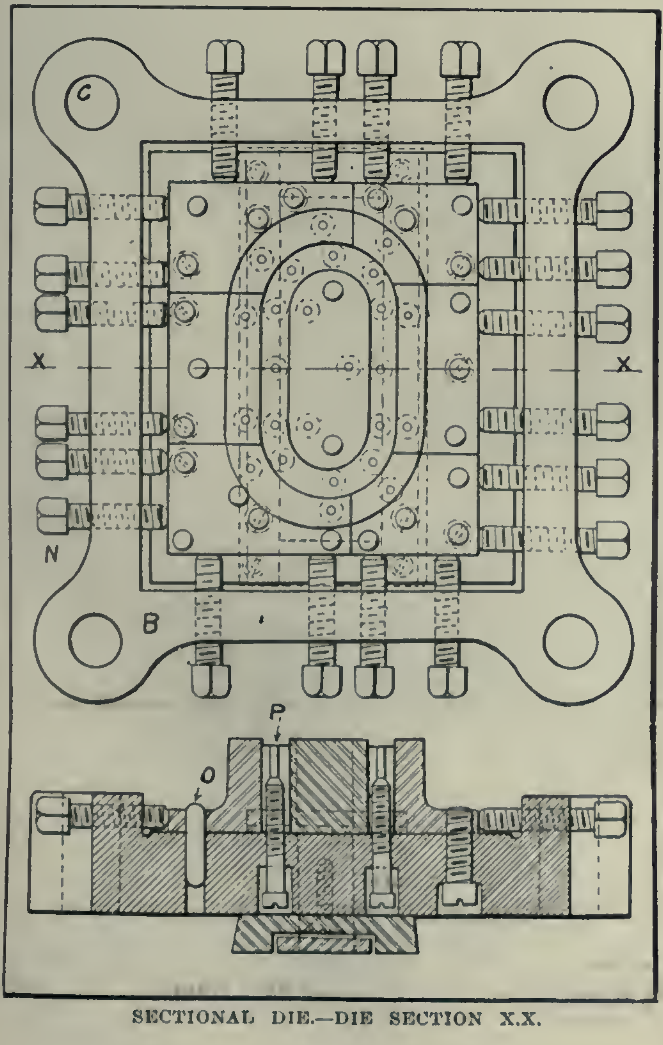
Constructional Features.

In making a die of this nature for thin metal, great care must be exercised and more than ordinary precaution taken in workmanship to have the punch fit the die all over, so as to shut out the light all around, and to cut a clear blank without leaving a burred edge.

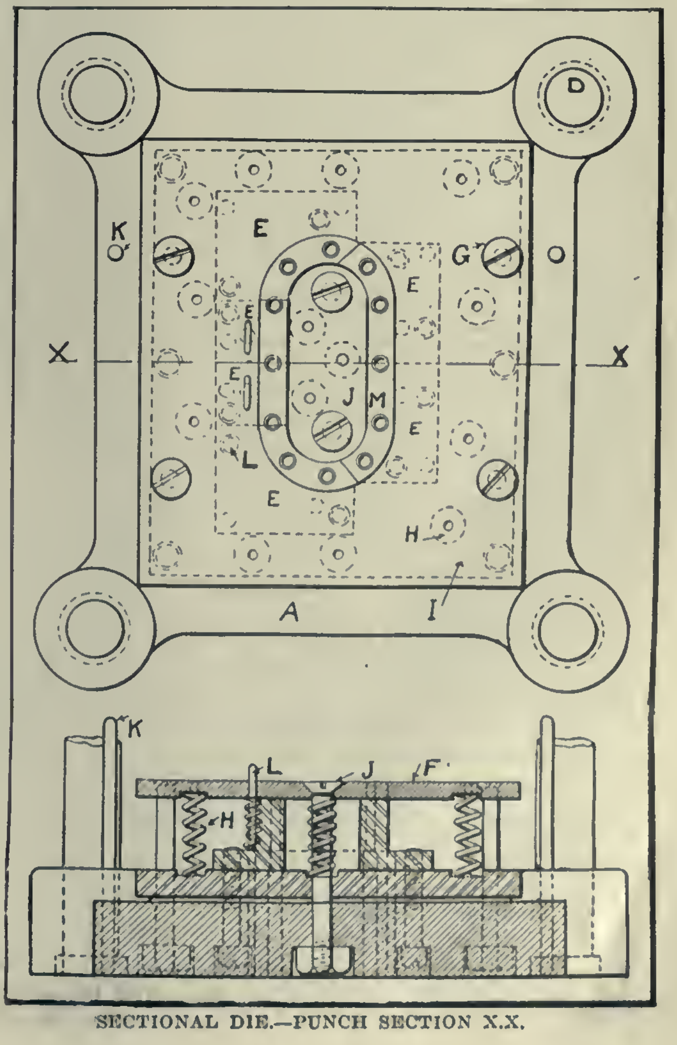
From practical experience it has been found best to harden only one of either the punch or die. If the blank is to be kept continually to a standard size, then we harden the punch and draw it to a very light straw color. As the die begins to wear, it is peened in, on where it is shown to wear, and sheared with the punch again. If the die is hardened, then vice versa. This method should not be adopted where hard or thick metal is used in blanking. The punch and die shown is used in a press of the inclined pattern, with automatic roll feed, the finished work sliding into a receptacle at the rear of the press.

The punch and die holders (A) (B) are made of cast iron and planed parallel bottom and top. They were clamped together and the four sub-press pin holes (C) drilled and reamed at the same time. The punch holder hole is counterbored at the bottom to a driving fit for the sub-press pin D. These pins are made of tool steel, hardened and ground all over. The head end drives in the punch holder, but the other end is a sliding fit in the die holder holes.

Punch sections (E) are made in six parts, and are held with two cap screws and two dowal-pins. After being machined and located, the master templet is used in locating and marking all the pierce holes and the shape of the punch. The punch must, of course, be parallel and square with the sub-press pins. A stripper plate (F) fits close to the



SECTIONAL DIE.—DIE SECTION X.X.



SECTIONAL DIE.—PUNCH SECTION X.X.

punch all over, and is adjusted to the proper height with four flat head screws (C) having a hexagon nut on the bottom, and twelve spiral springs (H). It will be noticed that there is a small hole in the centre of the spring seats, in order to transfer the holes to the bottom plate (I). These are in turn counterbored for a spring seat and in line with the stripper seats. In the centre of the punch is also located a stripper plate (J) fitted snugly to the punch, and held with two flat head screws and three spiral springs. Two guide pins (K) are located one on each side of the punch to keep the metal in parallel position. Two stop pins (L) are located on one side of the punch, with a spiral spring underneath. The punch bushings (M) are driven in, after being first located in the punch from the model templet and then transferred from the punch onto the die.

The die is designed very similarly to the punch and is held from the outside with set screws (N). The faces of the die-section are all relieved to save grinding as far as possible. In this operation, we have the punch on the bed of the press and the die on top. No pilot is used on this die, but the ordinary cam lever feed. The punch and die are used in an inclined press, which causes the punching to fall by gravity after being punched.

The stripping or ejecting device of the punch is made from a solid piece in a similar manner to the punch. There is a flange on the striper (P), 1/4 inch thick, which enters into a recess in the bottom of the die, preventing the ejector from dropping down. No springs are used with this device, it being actuated by a 5/8 inch rod which passes through the die and holder, and is struck by another rod fastened to the gate of the press, thereby forcing out the punching from the upper half.

When this punch and die is assembled we have practically a solid die without any dovetailing. Several of this design have been made, and are giving good satisfaction with regard to durability and accurate work.

DON'TS FOR DRAFTSMEN.

By D. A. Hampson.

WHAT follows, represents the point of view of the man who has to work from the drawings produced in the drafting room.

Don't use sixty-fourths or hundredths of an inch.

Don't depart from the shop standards in the matter of keys, tapers, bolts, threads, etc.

Don't put pattern sizes on drawings for the machine shop except where really necessary.

Don't neglect to give "over all" dimensions on details—the machinist needs them in his business.

Don't forget to mark a surface that is to be ground when there is a possibility of its being finished otherwise.

Don't forget to mark sizes, plus, minus or to give the limits of tolerance or to state running fits on assemblies.

Don't forget that a working centre line does not always divide a figure symmetrically, and that it should be marked C.L. or C|L.

Don't forget to use "light and shade" lines—lines of different widths—when they would assist in the interpretation of a drawing.

Don't send in checked drawings into the shop. If it should ever be necessary to do this, mark them "unchecked" in large letters.

Don't forget that one cross section is often better than two or three elevations.

Don't show a cross section without stating where it is taken, and without stating in what direction it is taken, if there is any chance of error on these two features.

Don't forget that numbering and naming parts is a great help to those who have material to order and to those who assemble.

Don't give dimensions at an angle when it can be avoided—machine tool movements are not built to travel that way.

Don't make all sections lining the same when two or more materials are shown; adopt the generally accepted standard and stick to it. The shop men will then take less time in deciphering a drawing.

Don't fail to keep the shop equipment in mind when designing any extensive work. Slight changes in the design will often keep work in the shop that otherwise would have to be sent elsewhere.

Don't forget that shops are not always as well lighted as drafting rooms, and consequently blueprints with faint lines and many lines crowded together waste much valuable time which should be otherwise employed.

Don't think that it is a waste of time to put the same dimension on twice on a large drawing; the machinist may spend four times that amount tracing the part back to the other end to find the figures.

Don't scorn a sketch in perspective; it is quickly made, appeals to the workman whose education was limited, and for a breakdown job or an experimental one, where the same part will never be needed again, there are points to commend it.

Don't forget that 12 in. d. or 12 in. dia. is better than just 12 in., and is a great help to the men who have to decipher a complicated drawing. The same consideration applies to the marking of radii.

Don't fail to designate by underscoring the figures or otherwise marking them, on any parts which are not drawn to the scale of the drawing. Measuring from a drawing is, of course, forbidden, but occasions do arise when it may be justified, and, again, the sense of proportion is strong in most men and aids materially in the quick reading of a plan.

Don't neglect to put all necessary notes on a drawing. Machinists are not supposed to be mindreaders, and, on work new to the shop especially, notes are of the greatest assistance. An intelligent and judicious use of them makes for the greatest co-operation and good feeling between the drawing room and the shop.

DRILLING CHILLED CAST IRON.

By D. O. Barrett.

A USEFUL little kink, which often comes in quite handy when drilling cast iron in which hard or chilled spots are likely to occur, consists in heating the piece, or, at least, the hard spot to a red heat, and placing a small piece of sulphur on the spot to be drilled. This procedure will be found to soften the iron sufficient for machining, and is often useful when turning pulleys with thin edges, which are often chilled. These may be heated, and the edges dipped directly in the sulphur.

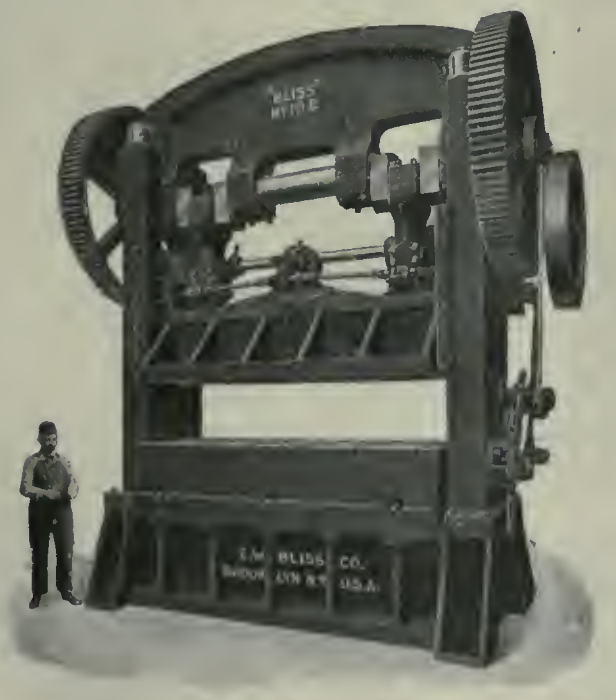
DEVELOPMENTS IN MACHINERY

A Record of New and Improved Machinery Tending Towards Higher Quality and Economical Production in the Machine Shop, Blacksmith Shop or Planing Mill.

LARGE DOUBLE CRANK PRESS.

AN indication of the rapidly increasing tendency towards the use of large presses for producing, from sheet metal, articles which were formerly castings and machine finished, is shown by the size of the double crank press in the accompanying illustration. This press, recently built by the E. W. Bliss Co., Brooklyn, N.Y., is one of the largest of its type built by the firm. It has a height of 19 feet, weighs 190,000 lbs., and exerts a working pressure of 750 tons. Owing to the strain to which the gearings is subjected, the entire train of gears consists of steel castings, machine cut out from the solid; the ratio of gearing being 38 to 1. The crank shaft which operates the slide has a stroke of 16 inches, and is made from a 50 point carbon, open hearth hammered steel forging, and to avoid all torsional strain when working, it is twin driven, arranged with a main driving gear on each end. The driving pinion on the intermediate shaft which imparts motion to the main gears is placed centrally on the intermediate shaft, thereby overcoming any torsion on this shaft.

The slide, the area of the face of which is 56 inches front and back, by 118 inches right and left, is adjusted by an independent electric motor fitted with a jaw clutch for starting and stopping. The motor is placed on the top of the slide, and operates through universal joint connections to the multiple thread worms on the main connections. Both connections are adjusted in unison, and alignments of the faces of the slide and bed is maintained in correct relation to each other. The counter balance of the slide is by counterweights placed on the main driving gears. The distance from the bed to the lower face of the slide, stroke and adjustment up, is 64 inches, adapting the press for dies of considerable height; when shallow dies are to be operated, bridge bolsters are used. The machine is controlled by a hand actuated powerful friction clutch of the double grip type. The clutch is arranged with an automatic device which automatically stops the press on the top centre, and which in addition permits of starting and stopping the moving parts at any point of the stroke independent of the automatic stop, giving the combined advantages of a positive automatic stop on the top centre, and absolute control over the moving parts at any point of the stroke.



BLISS LARGE DOUBLE CRANK PRESS WITH SPECIAL AUTOMATIC STOP FEATURE.

Control of the device which in turn controls the friction clutch is by means of a spring handle attached to the shifter handle, and which spring handle operates on a pin clutch. The pin clutch being operated direct from the shifter handle allows the operator to start the moving parts at any part of the stroke, independent of the automatic feature for stopping the press on the top centre. The pin clutch can by a small lock attached to the shifter handle be locked so that the press may be run continuously.

Te above mentioned automatic stop device is located on the lower part of the right hand upright, and is actuated from the crank shaft by means of connecting rod, crank disc, rack and pinion. The automatic stop feature operates on the up-stroke of the crank shaft, when the pinion engages with the pin clutch connected to the rocker shaft, to which are keyed the levers for operating the friction clutch. Another advantage in connection with this special feature of the press is that the latter cannot be set in motion by any accidental pressure against the shifter arm, as it is first necessary to operate the spring handle before the press can be set in motion.

The bearings of the back shafts, friction clutch and loose pulley are bronze bushel and the bushings have babbitt with graphite cast in them to aid lubrication. To avoid possible damage to the press by excessive pressure, the flywheel is arranged with a safety coupling. Some of the dimensions which may be of interest are noted below:

Area of bed 60 in. F & B x 126 in. R. & L.

Floor space 122 in. F. & B. x 215 in. R. & L.

Flywheel 60 in. diameter x 8 in. face. Weight 2,400 lbs.

THE MARK COLD DRAWN STEEL UNION.

THE Mark Manufacturing Co. of Chicago are putting on the market a pipe union, which presents some new features. This union differs from others in that it is made of cold drawn steel throughout. A new plant has been recently added to the firm's Evanston pipe mill, for the express purpose of producing this particular specialty.

Cold Drawing Process.

These cold drawn pipe unions are made from flat strip steel by the cold drawing process, making a fitting that is of course seamless and free from sand holes, pin holes, or similar structural defects. By the use of steel a very strong union is, of course, secured. The successive drawing operations are performed in a series of punch presses, ranging in weight up to over 100 tons, and individually driven by motors, ranging from 5 to 150 horse power. All of the dies for the new unions are constructed in a tool room, built and equipped for that purpose. This tool room is an interesting example of the application of individual motor drive, as all the lathes, shapers, automatic grinders, milling machines and other tools are driven by individual variable speed motors.

INTERIOR OF THE SHOP WHERE "MARK" UNIONS ARE MADE.

The plant includes a Sherardizing furnace for rendering the unions immune from rust and corrosion. The Sherardizing process is one which most engineers are thoroughly familiar with, and consists of heating the article to be Sherardized together with zinc dust in drums or retorts, which causes the zinc to penetrate a short way into the metal, and also leaves a coating. This method has proved to be the most satisfactory one yet found for rust-proofing threaded articles.

PRESS DEPARTMENT, THE MARK MFG. CO.

Building Feature.

The building in which this industry is carried on is naturally interesting, as practically all the latest methods and practice in fireproof building construction have been employed. A steel sash runs from about three feet above the floor almost to the eaves. The floor is paved with creosoted wood blocks, and the roof is covered with concrete tiles. The result is a well lighted, well ventilated building, free from interior columns, and well adapted for the purpose intended. The main building is 75 ft. x 200 ft., with a wing 70 ft. x 150 ft.

Process of Manufacture.

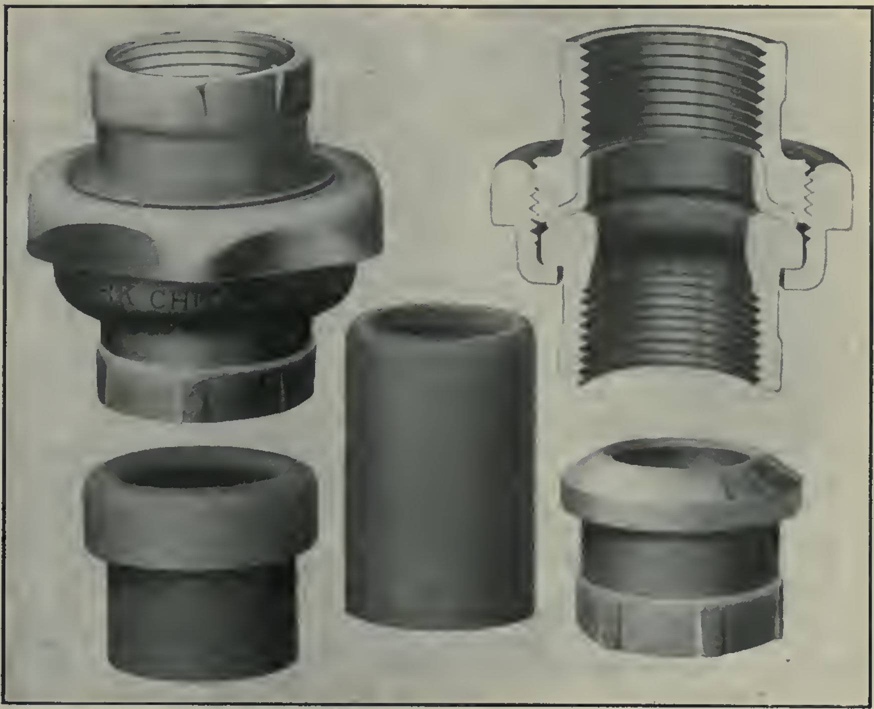
The Marks Seamless Cold Drawn Steel Union consists of the usual three main parts, male and female ends, joined by a coupling nut. All of these parts, as well as the brass seat ring, are drawn cold from flat stock, each piece being subjected to a series of operations, of which we illustrate four stages in the manufacture of the male member.

The manufacture, as before stated, starts with long steel strips, from which discs or blanks are cut. These discs are then drawn into a deep cup, from which the bottoms are punched, forming a cylinder as shown in the second cut. One end of this tube is then folded or rolled back upon itself to form a reinforcement, which the succeeding operations press into final shape. The lower end is upset to form the bead, and the part is ready for threading. The union is threaded to Briggs Standard for pipe threads, and so carries the same taper as the pipe. The material, high grade steel, is free from flaws, such as sand holes and kindred unseen defects commonly found in unions of a cast metal.

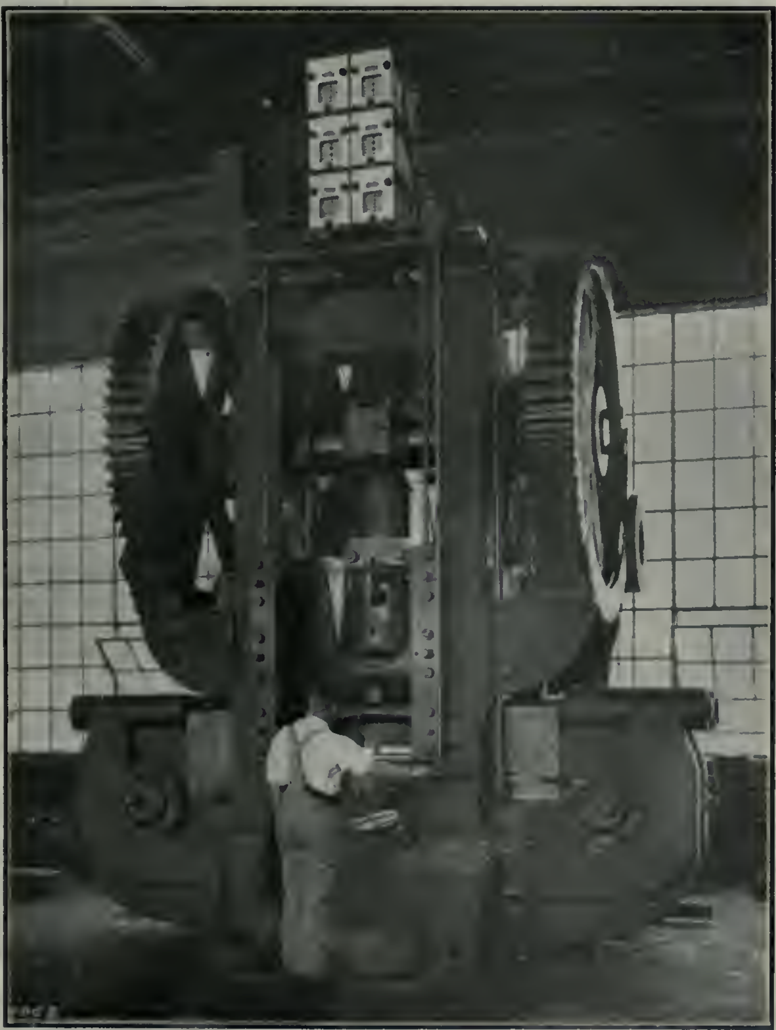
Another advantage of the Mark Union is that it is made of the same material used in wrought steel pipe. The expansion of steel unions under heat is the same as the expansion of the pipe, and the contraction when cooled is also the same. Under all conditions of temperature the steel union retains its tight grip on the pipe unchanged.

The Seat Feature.

Another novelty in the Mark Union is the densified, hardened steel seat, which is opposed to a very soft brass ring in the female end. This densified seat is formed by applying the die with such tremendous pressure that the metal is actually hardened. In this operation the pressure alone gives the seat a smooth, accurately shaped and polished surface. This seat engages the face of a ring drawn cold from dead soft brass, and annealed after drawing to keep it soft. When the coupling nut is screwed into place firmly, the densified steel seat makes, with the soft brass ring, a joint so effective as to be leak-proof under extreme pressures. Contributing to this feature is the fact that both the steel seat and brass ring are formed in dies without machining or grinding, and the fit of one face against the other is exact.



DETAIL OF THE "MARK" COLD DRAWN STEEL UNION.



A LARGE PRESS EMPLOYED IN THE MANUFACTURE OF "MARK" UNIONS.

The Sherardizing Feature.

Rust and corrosion are provided against in the Mark Union by putting every union through the Sherardizing process, which forms a zinc alloy, integral with the body of the metal over every part of the surface. This Sherardizing is done after the threads are cut, and protects them fully from corrosion, without altering in the slightest degree their sharpness and fit.

Electro-galvanizing is now extensively used in a large variety of trades. For many purposes it has proved superior to hot galvanizing, and in others has replaced nickel or copper plating. It has now become a well established fact that a zinc coating upon iron or steel is the best rust preventitive known.

Sense and Wit.—There are fifty men of wit for one of sense. He who carries about him nothing but gold will often be at a loss for want of change.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

THE PRODUCTION OF MALLEABLE CASTINGS.

By Dr. Richard Moldenke.

THE malleable casting is a very peculiar one. It has a place among iron products that is particularly unique. It is the only form of cast iron that we know of, in which, by the application of heat treatment, there is an absolute change from bad to good, or from a useless condition to a highly useful one. The malleable casting as it was known in the early part of the 18th century is the same casting as it is today; we have only fixed the underlying principles of the process, and know more about why things are done now than they did then. All attempts to change the making of malleable castings have failed; but we are learning how to make it more uniform.

A United States Product.

The malleable casting is a distinct product of the United States. Whereas, I presume, the entire production of malleable castings in the civilized world outside of the United States and Canada, may be placed at seventy-five thousand tons per annum, the capacity of this country is at least a million tons a year, and we probably make something like nine hundred thousand. This is a fairly large business when compared with the balance of the iron and steel industry, for the ordinary gray iron foundry output is about eight million tons a year. We are, therefore, dealing with something that has a very important place in the political economy of the country.

I have frequent requests from individuals and manufacturing concerns for information which will enable them to start in the malleable iron casting business, but I advise them to keep out unless they really have the right market conditions. Otherwise it would prove a rather costly experience. The producing capacity of the country grows with the demand, and anyone who goes into this business, without knowing just what the demand is, has got very serious times ahead af him.

A further difference between the malleable casting industry and that of the ordinary grey iron is that the plant is at least four times as costly; hence the "overhead" expense is to be reckoned with carefully. Moreover, the running capital must also be ample, as the "turn over" of the material is far slower than in the case of gray iron castings.

Classes of Malleable Castings.

Réaumur, the French chemist, described the first malleable iron that we know of in 1722; and that casting is today made in Germany, France and England as it was made then. There are two general classes of the malleable casting. The practice in America, and partly also in England now, is to make these castings with the so-called "black heart." If you fracture an American casting you will see that the interior is entirely white. In other words, the carbon of the European casting has been almost entirely removed, whereas the carbon in the interior of the American casting is nearly all there. There has been a conversion of the combined form of carbon to the so-called "temper-carbon."

Seth Boyden, of Newark, N.J., was the earliest manufacturer of malleable castings in the United States. It was probably introduced here from England. He experimented considerably, and left us a record of his work. Seth Boyden simply had to repeat the work of those who went before him, but he tried to learn for himself why those castings were made in that way. Probably a very costly business; because no man could illuminate the subject even if he would.

Malleable Casting Characteristics.

The most striking characteristic of the malleable casting is the remarkable resistance to shock. If you could see right through the structure, you would find that it is nothing more than a network, or an aggregation of crystals of steel with flakes of lamp-black between them. In other words, if you analyze the annealed casting, you would find the total carbon, say 3.75; made up of perhaps 0.40 combined carbon and all the rest graphitic carbon. Of course, silicon, manganese, phosphorus and sulphur are additional. The combined carbon is in crystals of iron, making them a 0.40 carbon steel; the graphite is there mechanically mixed between the crystals.

In the original hard white casting, the carbon is all in the combined form, but in the annealing process this is changed from the combined to the uncombined, amorphous graphitic state. If the skin of such an annealed casting is taken away, the interior portion will be found to contain the full amount of carbon changed, not to crystallized graphite, which pulls apart easily, but to an amorphous form appearing under the microscope like lampblack. As a consequence, when it comes to shock resistance, owing to the fact that the graphite is not crystallized in "malleable," you can batter it to pieces at one end, and the other will remain perfect.

In my early experience along this line, I cut coupons from scrap couplers of all shapes and kinds; and have taken them from couplers that had been in service a long time and come back worn out. I did the same with steel couplers; and the results indicated that whereas the malleable coupler invariably —if the iron was a good, proper malleable casting to begin with—showed up good metal, the steel coupler did not always do so. It seemed to me from these tests, that in a long steel casting, subjected to the streses of railroad service, the face would begin to open, the crystals going apart; while in the malleable they crush together, the amorphous graphite acting as a cushion. In steel, the opening up of the crystalline structure would go on long enough to eventually ruin the casting.

The other explanation would be that these steel castings may not have been properly annealed; and that they had casting strains which reduced their strength. The malleable casting is the best to use for railway service where extreme strength in tension is not essential.

The Strength Feature.

A good malleable casting ought to stand about 45,000 pounds to the square inch. I have made them as high as 63,000 pounds to the square inch, but would not recommend that for every-day work. When we go into high tensile strengths for "malleable," we begin to reduce the shock-resisting and twisting qualities. I think that the great mistake being made to-day by purchasers of malleable castings is that they ask too much tensile strength of the malleable casting. It would be far wiser for them to go to the steel casting at once, because, in trying to get a very high strength, they must sacrifice the qualities of ductility, softness, etc. The ordinary, normal malleable casting without steel additions in the mixture runs about 35,000 pounds to the square inch, and when we begin to add a little steel scrap, it will run to 45,000, or even up to 51,000 lbs. per square in. I have made about 80,000 tests on a "malleable," and the monthly average of the test bars started with 35,000 pounds to the square inch when I began the work, and the average of all of them, when I finished up, was about 51,000 pounds to the square inch.

In the malleable casting we deal with a material which has passed through a special heat treatment. It is hard to start with, and when it is annealed it is soft; hence we can safely use a square bar. This is broken in the middle for the transverse strength, and pulled in the testing machine for tensile strength. We deal with an iron that contains about 0.65 silicon, hence there is a very large interior shrinkage in the metal apart from the contraction of the casting itself. This averages a quarter inch to the foot. Furthermore, the iron sets very quickly, and the consequence is that when you pour a long bar, 13 to 15 inches long, the metal touching the sand sets first, and you have a liquid interior for a short space of time. Next, the gate cuts off with the interior of the bar still liquid, then this begins to set, and it shirnks and pulls apart inside.

The interior of a malleable casting, or of any casting, is therefore filled with a whole lot of planes of separation. When you put a piece into the testing machine, you will invariably find that the fracture shows up the interior shrinkage; there is a little bad spot in the centre, and it will always break at the weakest of these spots. I have repeatedly taken bars which had broken very close to the grip, put them in the machine again, and if they would break at the end again, I tried them the third time.

The first time the bar may be broken at 42,000 pounds, next at 48,000 pounds; and the third time at 54,000 pounds. It is simply a case of breaking first at the worst of these spots; then at a less bad one; and then the least bad one. The consequence is that, the test is better square than round, for the reason that in a square bar you get proportionally very much more sound material than in the round one; hence for malleable castings, you must never use a round test bar. If intricate castings are to be made, the design should suit this tendency to heavy shrinkage. They should be made so that there are no sharp corners nor very sudden changes from small to large section, because, in the large portion, there will be found a heavy shrinkage spot by the gate cutting off before feeding is complete.

Casting Structure.

To go into the structure of the casting itself:—The hard casting (before it is annealed) is of the same composition throughout. Analyze the interior or the skin, and you will find the same composition. After the annealing, it is different. In the annealing, there is a change from the combined carbon to the amorphous "temper carbon," and also the removal of some carbon from the casting surface. In European malleable castings, the removal continues through, as these are always thin and small, and are annealed at higher temperatures. On of an inch off, and you find ature is just high enough to permit this carbon conversion and no more. Plane off the skin and in it you find 0.20 carbon; plane the next sixteenth 0.65; another sixteenth off, 1.50: and in the centre, perhaps 3.25, or whatever the total carbon in the hard casting may have been.

If you take a malleable wedge, put it in the fire, make red hot, plunge and quench it, you can file the very thin edge. If you go through this skin, you strike 1.50 carbon. There you have tool steel which will not file away. Further back, grinding through this hard portion, you get the interior softness again. If you try to straighten a malleable casting by making it red hot you are liable to produce this very thing, and there is a chance for the reconversion of the amorphous graphite or "temper carbon" back into combined carbon again. An instance of this in point:—

We had a rush order for a lot of guard plates, I think ⅝-inch thick—and they came out of the anneal badly bent. The best thing was to try to straighten them cold, there being no time to straighten them hot, and put them back into the anneal again. These plates were in the blacksmith's fire and straightend. Every one of them came back from service with the heated part broken off. The portion which had been heated and hammered was steely and white, and the portion not heated was nice and black. Here, was that change of the uncombined carbon to the combined, which goes to show how sensitive the malleable casting is to heat treatment. Straightening should be done cold.

An excellent service test of the malleable casting is the placing of test lugs on castings, and trying to make them about the same thickness as the casting. They are broken off to see if the fracture indicates good material. Foundrymen do not like to leave them on for the inspection of their customers. From the standpoint of the customer, they should be available. In important work, however, it is well to have these lugs in several locations, so that they could be broken off afterwards in order to have assurance that the casting was properly annealed before it was sent out.

As far as pattern work is concerned, there is very little to say more than that the malleable casting is naturally made very thin and ribbed, as a rule, because by reason of its strength it replaces a gray casting perhaps twice or three times as thick. The malleable casting, is essentially repetition work. I have often received in our works orders for 65,000 to 100,000 pieces of one kind. It is rather nice work, because of requiring enormous quantities; hence, the molding machine has a good place in the malleable shop, and it is beginning to get there. The permanent, that is the iron mold will find in the malleable casting shop perhaps its best application. So far there has not been much done in this line yet, but it is bound to come.

There are very few castings made in the malleable business that are not cored out. The very use of a strong, light malleable casting to replace gray iron means core work, so that the core room is a very important department in the malleable shop.

Process of Manufacture.

We come to the process. These are the crucible, cupola, Bessemer converter, air furnace, open hearth, and electric. The crucible process makes the finest malleable as it does the finest steel, with the exception of the electric furnace—a comparatively new development. It is expensive, however, and consequently you will find the crucible made casting only in Europe, where the malleable casting is more expensive than the steel casting. To show the differences in practice between Europe and this country, I will mention that I had to do with the designing of one of the largest European malleable plants. They made American malleable castings in it up untli two years ago. Then they had to give up making the American malleable casting for the reason that in Europe they machine their malleable castings.

The last thing to do with the American "black heart" malleable casting is to machine it. The skin is the strongest portion of the malleable casting, although it does not follow that the interior is not good, because I have often, to satisfy myself, taken a malleable casting, planed off all the decarbonized portions and tested the interior; and where I found that the casting itself would stand about 43,000 to 48,000 pounds to the square inch, the interior portion alone stood about 42,000 pounds to the square inch. In Europe, they take their malleable casting, turn it and finish it; as they do nearly all their work, and as the interior shrinkage naturally bothered them, they had to go back to the European decarbonization method to succeed.

(To Be Continued.)

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PRINCIPAL CONTENTS.

WHY COLLEGE-BRED MEN OFTEN FAIL.

IT is late in the day for a writer in an English contemporary to venture the assertion that a technical school training should come after shop experience, and not before, as is usually the case. Attempts are being made in some large American cities, Cincinnati in particular, to introduce the Sandwich system, i.e., arranging for youths to spend part of their week at college, and the remainder in some large shops in the vicinity. This is an improvement on the old system, but we are of opinion that a boy should be sent straight from high school to the shops, and to college only after he has received a thorough training in every branch of the trade.

It is often noted that the most brilliant men in engineering colleges are those who have been sent to work at an early age to earn their own living, and have won scholarships for universities after hard night work. Once these men get hold of the elements of mathematics and chemistry, with a little ability as draughtsmen, nothing can compare with them. The putting of the theoretical and the practical together is to them a most natural process. With the boy at college it is different. He may never have been in a machine shop or foundry before in his life, and probably there are those in the same class who have spent several years in the shops, or who played in them as boys. The result is that the instructors have a tendency to take too much for granted, and a portion of the boys go through college looking upon machine tools, steam engines and electric motors as mysterious animals, who perform certain functions, but they never know why. There are some instructors in colleges who become attached to students who have an unusual knowledge of their work, and will carry on long arguments in class, while the others look on and listen to this strange lingo, not daring to say anything for fear of revealing their ignorance.

The writer referred to above, objects to colleges carrying out work for manufacturing firms, claiming that no college can turn out men competent to do this work. He is quite right in this, and even the practice of building machinery in colleges to be used later by the students, is wrong as sometimes carried out. As a rule the average class in an engineering college is the most diversified bunch imaginable. There is the little fellow half way through his teens, who has never learned to use a file. There is the boy past twenty who knows as much as the instructor; and there is the engineer's son, who knows machinery, but lacks the principles. This is the class which starts out to build a gas engine say, the castings and drawing of which have been supplied by a local firm. The boys who begin with the file, will get the filing to do, the harder machine work being done by the more experienced lads, and by the instructor himself. It would be foolish ever to expect a college to turn out machinery under commercial conditions. It usually takes the boys several years to make a machine, the work passing from one generation to another.

After all, it is the parent who requires the advice, and he cannot be reached through the columns of an engineering journal. He fondly desires that his son be an engineer and, having the money, he sends him to a college, not wishing him to be as other boys are. When the boy comes out of college, he must either descend to the shops at the foot of the ladder, or, unless he is quite brilliant, he will be a failure.

If the manufacturer esteems intelligent, high-grade employees with peace and contentment in his works, he will strive to carry out a program which includes good wages, fair terms, and freehold homes for his people. Manufacturers are responsible to their associates, their stockholders and the world at large, not only for the successful conduct of the industrial institutions, but in a higher way they are responsible for their standing before the public in the light of honest, just men who recognize certain Divine principles in the management of this great world, and who stand steadfast as a rock for the carrying out of these principles—justice, integrity and humanity.—C. W. Post.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

	Per Ton.	
Foundry No. 1 and 2, f.o.b., Midland	$19 00	$19 50
Gray Forge, Pittsburg	....	14 65
Lake Superior, charcoal, Chicago	.....	16 25
	Mont'l.	Tor'to.
Canadian f'dry, No. 1..	$21 00	$20 00
Canadian f'dry, No. 2..	20 50	19 50
Middlesboro, No. 3....	23 50	23 50
Summerlee, No. 2	25 00	26 50
Carron, special	25 00	.....
Carron, soft	25 00	.....
Cleveland, No. 1	24 25	25 00
Clarence, No. 3	23 75	24 50
Jarrow	.....	25 50
Glengarnock	.....	26 00
Radnor, charcoal iron.	30 00	34 50
Ferro Nickel pig iron (Soo)	.....	25 00

BILLETS.

	Per Gross Ton.
Bessemer billets, Pittsburgh ..	$26 50
Open hearth billets, Pittsburgh	26 50
Forging billets, Pittsburgh	34 00
Wire rods, Pittsburgh	29 00

FINISHED IRON AND STEEL.

Per pound to large buyers:

	Cents.
Common bar iron, f.o.b., Toronto..	2.10
Steel bars, f.o.b., Toronto........	2.30
Common bar iron, f.o.b., Montreal.	2.15
Steel bars, f.o.b., Montreal........	2.25
Bessemer rails, heavy, at mill....	1.25
Iron bars, Pittsburgh	1.65
Steel bars, Pittsburgh, future	1.40
Tank plates, Pittsburgh, future...	1.45
Beams, Pittsburgh, future	1.45
Angles, Pittsburgh, future	1.45
Steel hoops, Pittsburgh	1.60

Toronto Warehouse f.o.b., Toronto.

	Cents.
Steel bars	2.40
Small shapes	2.45

Warehouse import, freight and duty to pay:

	Cents
Steel bars	1.95
Structural shapes	2.05
Plates	2.05

Freight, Pittsburgh to Toronto:

18 cents carload; 21 cents less carload.

BOILER PLATES.

	Mont'l.	Tor'to.
Plates, ¼ to ½-in., 100 lbs.	$2.35	$2.35
Heads, per 100 lbs.........	2.65	2.95
Tank plates, 3-16 in.	2.60	2.60
Tubes, per 100 ft., 1 inch	9.00	8.50
" " 1¼ in.	9.00	8.50
" " 1½ "	9.00	9.00
" " 1¾ "	9.00	9.00
" " 2 "	8.75	8.75
" " 2½ "	11.50	11.50
" " 3 "	12.00	12.00
" " 3¼ "	13.75	13.75
" " 3½ "	14.50	14.50
" " 4 "	18.00	18.00

BOLTS, NUTS AND SCREWS.

	Per cent.
Stove bolts	80 & 7½
Machine bolts, ⅜ and less	65 & 5
Machine bolts, 7-16.......	57½
Blank bolts	57½
Bolt ends	57½
Machine screws, iron, brass	35 p c.
Nuts, square, all sizes.....	4c per lb off
Nuts, Hexagon, all sizes..	4¼ per lb off
Flat and round head.....	35 per cent.
Fillister head	25 per cent.
Iron rivets	60, 10, -0 off
Wood screws, flathead, bright	85, 10 p c off
Wood screws, flathead, brass	75, 10 p c off
Wood screws, flathead bronze	70, 10 p c off

National-Acme "Milled Products."

Sq. & Hex Head Cap Screws	65 & 10%
Sq. & Hex Head Cay Screws	65 & 10%
Rd. & Fil. Head Cap Screws	45-10-10%
Flat & But. Head Cap Screws	40-10-10%
Finished Nuts up to 1 in. ..	75%
Finished Nuts over 1 in. ..	72%
Semi-Fin. Nuts, up to 1 in...	75%
Semi-Fin. Nuts over 1 in.....	72%
Studs....	65%

Discounts f.o.b., Montreal.

WROUGHT IRON PIPE.

The following are Toronto jobbers' discounts on pipe in effect from April 21, 1913:

Standard	Buttweld Black	Buttweld Gal.	Lapweld Black	Lapweld Gal.
¼ ⅜ in.	62	47	....	....
½ in.	68	58	....	....
¾ to 1½	71½	61½	68½	58½
2 in.	71½	61½	68½	58½
2½ to 4 in. ..	71½	61½	70½	60½
4½ to 6 in. ..	....	....	71½	61½
7. 8, 10 in. ..	....	....	66	54

X Strong P. E.

¼, ⅜, ½in. ..	56½	46½	....	....
¾ to 1½ in. ..	67½	57½	....	....
2 to 3 in.	68½	58½	....	....
2½ to 4 in. ..	....	....	65	55
4½ to 6 in. ..	....	....	64	56
7 to 8 in.	....	....	65	45

XX Strong P. E.

½ to 2 in.	43	33	....	....
2½ to 4 in. ..	....	....	43	33

PRICES OF WROUGHT IRON PIPE.

Standard. Nom. Diam.	Standard. Price. per ft.	Extra Strong. Sizes Ins.	Extra Strong. Price per ft.	D. Ex. Strong. Size Ins.	D. Ex. Strong. Price per ft.
⅛in	$ .05½	⅛in	$ .12	½	$ .32
¼in	.06	¼in	.07½	¾	.35
⅜in	.06	⅜in	.07½	1	.37
½in	.08½	½in	.11	1¼	.52½
¾in	.11½	¾in	.15	1½	.65
1 in	.17½	1 in	.22	2	.91
1¼in	.23½	1¼in	.30	2½	1.37
1½in	.27½	1½in	.36½	3	1.86
2 in	.37	2 in	.50½	3½	2.30
2½in	.58½	2½in	.77	4	2.76
3 in	.76½	3 in	1.03	4½	3.26
3½in	.92	3½in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4½in	1.27	4½in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.86	...	.....
7 in	2.38	7 in	3.81	...	.....
8 in	2.50	8 in	4.34	...	.....
8 in	2.88	9 in	4.90	...	.....
9 in	3.45	10 in	5.48	...	.....
10 in	3.20	....	....	...	.....
10 in	3.50	....	....	...	.....
10 in	4.12	....	....	...	.....

IRON PIPE FITTINGS.

Canadian malleable, 40 per cent.; cast iron, 65; standard bushings, 70; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 75; malleable, lipped unions, 65.

COKE AND COAL.

Solvay Foundry Coke	5.95
Connellsville Foundry Coke	5.45
Yough, Steam Lump Coal	3.93
Penn. Steam Lump Coal	3.63
Best Slack	2.95

All net ton f.o.b. Toronto.

OLD MATERIAL.

	Mont'l.	Tor'to.
Copper, light	$10 50	$11 50
Copper, crucible	13 00	14 50
Copper, uncr'bled, heavy	12 00	12 50
Copper wire, uncrc'bled	12 00	12 50
No. 1 machine compos'n	10 50	11 50
No. 1 comps'n turnings	9 50	9 50
No. 1 wrought iron	.....	9 00
Heavy melting steel	.....	8 00
No. 1 machine cast iron	.....	14 00
New brass clippings	8 50	8 50
No. 1 brass turnings	7 25	7 80
Heavy lead	3 25	2 90
Tea lead	2 50	2 50
Scrap zinc	3 25	3 50

Dealers' purchasing prices.

METALS.

	Mont'l.	Tor'to.
Lake copper	17.00	14.75
Electrolytic copper	17.00	14.75
Spelter	6.00	5.50
Lead	5.25	5.10
Tin	43.75	43.00
Antimony	10.00	9.75
Aluminum	21.00	22.00

SMOOTH STEEL WIRE.

No. 6-9 gauge, $2.35 base; No. 10 gauge, 6c extra; No. 11 gauge, 12 extra; No. 12 gauge, 20c extra; No. 13 gauge, 30c extra; No. 14 gauge, 40c extra; No. 15 gauge, 55c extra; No. 16 gauge, 70c extra. Add 60c for coppering and $2 for tinning.

Extra net per 100 lb.—Spring wire; bright soft drawn, 15c; charcoal (extra quality), $1.25.

SHEETS.

	Mont'l.	Tor'to.
Sheets, black, No. 28	$2 85	$3 00
Canada plates, ordinary, 52 sheets	2 80	3 00
Canada plates, all bright.	3 70	4 15
Apollo brand, 10¾ oz. (American)	4 30	4 20
Queen's Head, 28 B.W.G.	4 50	....
Fleur-de-Lis, 28 B.W.G.	4 20	....
Gorbal's Best Best, No. 28	4 45	....
Viking Metal, No. 28	4 40	....

NAILS AND SPIKES.

Standard steel wire nails, base	....	$2 40
Cut nails	$2 60	2 65
Miscellaneous wire nails	75 per cent.	
Pressed spikes, ⅝ diam., 100 lbs.	....	2 85

FINE STEEL WIRE.

Discount 25 per cent. List of extras. In 100-lb. lots: No. 17, $5; No. 18, $5.50; No. 19, $6; No. 20, $6.65; No. 21, $7; No. 22, $7.30; No. 23, $7.65; No. 24, $8; No. 25, $9; No. 26, $9.50; No. 27, $10; No. 28, $11; No. 29, $12; No. 30, $13; No. 31, $14; No. 32, $15; No. 33, $16; No. 34, $17. Extras net. Tinned wire, Nos. 17-25, $2; Nos. 26-31, $4; Nos. 30-34, $6. Coppered, 75c; oiling, 10c.

MISCELLANEOUS.

	Cents
Putty, 100 lb drums	$2.70
Red dry lead, 560 lb. casks, per cwt.	6.00
Glue, French medal, per lb	0.10
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.26
Benzine, per gal.	23½
Pure turpentine	0.60
Linseed oil, raw	0.60
Linseed oil, boiled	0.63
Plaster of Paris, per bbl.	2.10
Plumbers' Oakum, per 100 lbs.	3.25
Pure Manila rope	17

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents.

Montreal, July 14, 1913.—A waiting attitude still characterizes the machinery equipment, iron, steel and metal markets. There is no decided tendency either way, a feature, in itself, not without encouragement. Orders on hand are still of sufficient volume in most industrial and manufacturing establishments, to warrant an optimistic forecast of the near future, and with latest crop advices favorable and other conditions generally sound, we look for a renewal of demand from consumers of mechanical engineering products. Copper has been somewhat lower to-day than during the past two weeks, while antimony and spelter show no change. Tin shows an advance over last prices, but activity is in no sense marked. Copper is a trifle lower than reported a week ago.

Toronto, July 15th, 1913.—Conditions in the machinery and metal market are inclined to be quiet, although in some lines the demand has been better than might be expected. The A. R. Williams Machinery Co. report a fair demand for machine tools with future prospects looking more favorable. There is also a pretty fair demand for electrical equipment, some interesting specifications having been received. The demand for wood-working machinery is slack at present, but better things are expected later in the season. The Canadian Fairbanks Co. also report a fair demand for machine tools with business in other departments steady. Prices in the metal market are practically stationary, and business as a rule is quiet. United States and British Mills are very busy and so it is still difficult to get good deliveries. Pig iron market is dull, with little change in prices. The demand for tool steel is good, several nice orders having been placed recently.

AMERICA'S FIRST SAFETY EXPOSITION.

THE First International Exposition of Safety and Sanitation ever held in America will take place in New York City on December 11th, to 20th, 1913, under the auspices of The American Museum of Safety. Safety and health in every branch of American industrial life, manufacturing, trade, transportation on land and sea, business, engineering, in all of their sub-divisions will be represented at this Exposition. It will be the first step toward making a representative exhibition of the progress of safety and preventive methods in America.

There will be absolutely no limit to the scope of the Exposition, as it will embrace everything devoted to safety, health, sanitation, accident prevention, welfare, and the advancement of the science of industry.

By a special Act of Congress, exhibits from Europe and other foreign countries are to be admitted free of duty. European employers have cut their accident and death rate in half by a persistent campaign for safety. There are 21 Museums of Safety in Europe. All of these various Museums will contribute to the American Exposition.

In the United States, every year, 40,000 workers are killed, and 2,000,000 are injured, while 3,000,000 are ill from preventable causes. A conservative estimate of the wasted wage earning capacity of the latter for one year is four hundred million dollars. Thus, it can be seen what this continent has to accomplish in the way of conserving human resources. The main object of the First International Exposition of Safety and Sanitation is to point the way.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Engineering

Toronto, Ont.—The Perolin Co. of Canada will erect a factory at Toronto.

Weston, Ont.—The Moffat Stove Co. has awarded the contract for a three-storey foundry and nickel plating shop to cost $25,000.

Revelstoke, B. C.—A foundry for the manufacture of cast iron stoves and heaters, as well as for brass and iron castings, is to be located here and will be ready for operation in the fall.

Prince Albert, Sask.—It is reported that a new industry will be started here for the manufacture of horse shoes, steel castings, sheets and bars, etc. J. J. Kreis, of Pittsburg, is representing the syndicate behind the venture.

Bridgeburg, Ont.—The Canadian plant of the Chicago Bridge & Iron Works Company, at Bridgeburg, Ont. (opposite Buffalo), is nearing completion and its operation will be commenced as soon as the equipment is installed.

Calgary, Alta.—The Northwestern Brass Co. has awarded the contract to Westinghouse, Church, Kerr & Co., New York City, for the construction of a foundry building 100 x 200 feet, with a wing 40 x 73 feet. The plans have been prepared by the A. B. Baker Engineering & Appraisal Co., Buffalo, N. Y. Reinforced concrete will be used throughout.

Hamilton, Ont.—The Dominion Steel Foundries Co., which was formed to take over the Hamilton Malleable Iron Co. and the Dominion Steel Castings Co., have purchased 3¾ acres adjoining the plant of the Dominion Steel Castings Co., and will shortly commence to build a new plant. Prack and Perrine, 36 James Street, Hamilton, Ont., are architects and engineers.

Galt, Ont.—President George A. Dobbie, of the Board of Trade, has verified the reports from Boston that the B. F. Sturtevant Company intended to establish a Canadian branch here. He stated that the agreement had been signed for the United States concern to start operations about August 1, with fifty or sixty hands, in the factory recently occupied by Canadian Motors, Limited. They have taken three and a half acres on the southern sub-division of Galt Lands, Limited, and will increase their holdings to six acres.

Electrical

Welland, Ont., will engage an electrical wire inspector, who will also be employed by other towns and cities in the district.

Merritt, B. C.—The town council is planning to extend the power plant. A second 125 kw. unit, three-phase, 60 cycles, 2,300 volts, will be installed.

Peterboro, Ont.—The city is now having valuations made of the plant and distribution system of the Peterboro Light & Power Co. with a view to taking it over.

Burnaby, B. C.—The British Columbia Telephone Co. will place aerial cables, poles and wires in Edmonds and the Burnaby lake district. An estimate for the whole of the Collingwood territory is in hand.

Welland, Ont.—The Niagara, Welland and Lake Erie Railway Co., who have operated a mile of electric railway in Welland for a year or more, are laying tracks for a half mile extension in Welland.

Coaticook, Que.—Tenders for an iron penstock for the upper dam of the

PROBABLE EQUIPMENT REQUIREMENTS

The undernoted firms are now, or likely to be soon in the market for new equipment, etc. For fuller details, reference should be made to the news items:

Machine Tools.

B.C Electric Ry., Vancouver, B.C.

Nat. Transcontinental Ry., Ottawa.

Moffat Stove Co., Ltd., Weston, Ont.

North West Brass Co., Ltd., Calgary.

Can. Pacific Ry., North Bay.

Can. Pacific Ry., North Bay.

Woodworking Machinery.

Wm. Rutherford & J. Merrian, Medicine Hat.

The Bridges Lumber Co., Fort Steel, B.C.

H. R. Doodday, Scotts Junct., P.Q.

Turbo Generators.

Toronto Hydro-Electric Co.

Steam Boilers.

Toronto Hydro-Electric.

Electrical Supplies.

Burnaby, B.C.

C.P. Ry., Montreal.

Cannal & Spencer Construction Co., Edmonton, Alta.

American Cyanamide Co., Niagara Falls.

Foundry Supplies.

Revelstoke Fdry. Co., Ltd.

North West Brass Co., Calgary.

Generators.

Merritt, B.C.

Railway Contractors' Supplies.

Twohey Bros.

Canadian Pacific Railway, North Bay, Ont.

Canadian Pacific Railway, Vancouver, B.C.

Brick Plants.

Great West. Coal and Brick Co., Estevan, Sask.

Shale Face Brick Co., Victoria. B.C.

Ruggles, Winters & Huntingron, North Battleford.

Municipal.

Coaticook, Que.

Refrigeration.

Creamery & Cold Storage Co., Medicine Hat.

Civic Electric Light Station were called for recently, and three were submitted by Sherbrooke firms. The prices were so high that the council ordered the old one to be rebuilt with wood.

Toronto, Ont.—The Hydro-Electric System will erect a $1,000,000 reserve auxiliary plant for the supply of power to the water works, etc. This enterprise has now the approval of both local and Government bodies. W. Ellis is chairman of the Commission.

Sidney, C.B.—It is reported that Newcastle is to be the Atlantic terminus of the Universal Radio Syndicate, who are proposing to establish an All-British wireless telegraph system round the world. The syndicate controls the Poulson and Dudel patents.

Vancouver, B. C.—The British Columbia Electrical Railway, Vancouver, is having plans prepared for the construction of shops at Burnaby, B. C. These will consist of a machine shop, blacksmith shop, wheel shop and store house in a combination building 70 x 355 feet, machine shop, 70 x 160 feet, stripping and erecting shop with 10 pits, wash and wheel shop, 65 x 120 feet, storehouse 35 x 130 feet and a paint, erecting, wood working, cabinet, door and sash varnishing building, 130 x 330 feet. In this latter building is included oil and paint storage basement and oil serving equipment. All the buildings will be of structural steel with concrete foundations, brick walls and wood roof. The company is also planning the construction of a double deck car barn in Vancouver. The first floor will be 130 x 350 feet and the second floor 130 x 300 feet. The barn will contain a small machine shop and store room, oil room and sand apparatus. Other construction planned is a car barn, 105 x 300 feet, at North Vancouver and a barn and shops at Victoria, B. C. Westinghouse, Church, Kerr & Co., New York, are the engineers for all this work.

Municipal

Toronto, Ont.—The city is contemplating the elimination of all horses from its fire department, substituting motors.

Kerrisdale, Pt. Grey, B.C.—On June 23rd, the ratepayers passed three by-laws, including one to purchase water and sewerage systems at Shaughnessy Heights, and an incinerator.

Edmonton, Alta. — The Wabamun Power and Coal Company, Limited, have submitted a proposition to the City Council in which they offer to supply the city with electricity at $1.22 per k.w. as against $1.98 which is the price the city are paying at present. The company have large coal areas near Wabamun Lake where the power plant will be located.

Calgary, Alta.—It is proposed to erect a municipal building in the near future. The plans call for a modern factory building of eight or ten storeys in which space is to be leased for small industries. The new structure will contain every facilitiy for the small manufacturer, the cost being estimated at $250,000.

B. F. STURTEVANT PLANT FOR GALT, ONT.

Governor Eugene Foss came out with a statement on July 13 condemning the U. S. Democratic Congress for its tariff legislation, and announcing in the future he would do the greater part of his machinery manufacturing in Canada. This statement followed the announcement that the B. F. Sturtevant Co., the concern which the Governor controls, had purchased the factory of the Canadian Motors Co. at Galt, Ont. The Governor's statement in part is as follows: "For more than twelve years one of the principal Massachusetts corporations which I represent has had under consideration the scheme of transferring to Canada a large portion of its work. I have personally opposed this plan, and have endeavored to maintain this industrial enterprise in full here in Massachusetts, but am now convinced that it is no longer possible to defer action on this matter. Accordingly, I make the announcement, although I do so with sincere regret, that the B. F. Sturtevant Co. has just completed the purchase of a manufacturing plant in Galt, Ont., and that a large part of the work which has hitherto been done at Hyde Park will now be transferred to Canada, the refuge.

Port Dalhousie, Ont.—The town is looking forward to extensive municipal improvements in the near future. A Toronto engineer, engaged by the local council, has planned a system of waterworks and sewerage that will cost $150,000. The waterworks scheme will probably be placed before the ratepayers in 1914. The installation of a system would necessitate the construction of a standpipe and the pumping of water out of Lake Ontario.

General Industrial

Rosebank, Man.—The Northern Eleator Co.'s elevator at Rosebank, Man., was destroyed by fire last week.

Medicine Hat, Alta.—A company has agreed to build a creamery and cold storage plant here. It will cost $50,000.

Medicine Hat, Alta.—John H. Tabor, of Lethbridge, will probably build a $25,000 factory here, employing 200 hands.

North Battleford, Sask.—Ruggles, Winters & Huntington are installing a plant for the manufacture of patent facing bricks.

Estevan, Sask.—The Great West Coal & Brick Co. will spend $87,000 on new machinery. The president of the company is J. A. Kinney, barrister, Kenora, Ont.

Medicine Hat, Alta.—John H. Tabor, of Lethbridge, has deposited a $500 cheque with the city as evidence of good faith that he wil build a $25,000 factory, employing 200 hands.

Victoria, B. C.—A plant will be erected on Madge Island by the Capital Shale Face Brick Co., which is capitalized at $100,000, and is being promoted by M. T. Bond, of Litchfield, Eng.

Listowel, Ont.—It is reported that Mr. Max. Becker, of Toronto, has sesured a lease on the Bender building, and purposes using it for the establishment of a knitting factory, which will employ possibly from fifteen to twenty-five hands.

Port Coquitlam, B.C.—The C. P. R. have commenced construction work on a new oil station here, which will be the receiving station for a pipe line running from Port Moody. The oil will be brought by ships to Port Moody and pumped to this city for use in the railway yards of the company.

Niagara Falls, Ont.—The American Cyanamid Co. is planning the erection of an extensive plant which will be of structural steel and reinforced concrete and tile brick construction. The plant will consist of the following buildings: Carbide building, 110 x 144 feet; cyanamid building, 91 x 390 feet; hydrating and granulating building, 110 x 220 feet; cooling building, 85 x 110 feet; raw material bins, 26 x 53 feet; wash house, 40 x 97 feet; office building, 31 x 81 feet; laboratory, 31 x 81 feet; liquid air building, 60 x 120 feet; store house, 40 x 80 feet; coke dryer building, 32 x 81 feet; and miscellaneous buildings. Lime nitrogen silos, 56 x 56 feet and lime kiln building 50 x 115 feet. The plant will be fitted with electrical equipment. Westinghouse, Church, Kerr & Co., New York City, have been commissioned to design and build the plant.

Wood-Working

Wm. Rutherford and J. Merriam, Medicine Hat, Alta., will spend $15,000 on woodworking machinery.

The Bridges Lumber Co., Fort Steel, B. C., is erecting a saw mill on the Kootenay River, which will have a capacity of 45,000 ft. per day.

Saint Cajetan d'Arnagh, Que.—On July 9 fire destroyed the saw mill of Mr. Fortunas Pouliot, and a large quantity of lumber. The loss is $5,000.

Scott's Junction, Que.—H. R. Doodday & Co.'s lumber mills were destroyed by fire last week. The loss amounts to $60,000.00, and is covered by insurance.

Amos Harricana River, Que.—Tenders for the $3,000,000.00 Provincial Legislative Building were opened July 8th, but only two firms had tendered, the Lyall Mitchell Co., Montreal and Winnipeg, and Thomas Kelly & Sons, Winnipeg. The tenders have been submitted to two architects for their report.

Railways--Bridges

Maisonneuve, Que.—The judgment rendered recently by the Railway Commission provides that the C. P. R. build a bridge across Charlemagne Street.

Montreal, Que.—The C. P. R. will string 4,775 miles of new wire on western lines during the next 5 months. The contracts for all the work have not yet been let.

Brampton, Ont.—The Roads and Bridges Committee last week recommended to the council the erection of a bridge with concrete abuttments for the creek on Flodden Street.

Ashcroft, B.C. — Twohy Brothers, railway contractors, expect to have their contract for the construction of a section of the Canadian Northern east and west of Ashcroft completed some time in August of this year.

This section runs from Spenco's Bridge east to Wallachin, a distance of approximately 45 miles. The work on the line was begun last fall.

Twohy Brothers have a contract for the construction of a hundred miles of line in the division north of Kamloops, from Mile 80 to Mile 180, and of this they have already completed 65 miles.

North Bay, Ont.—Work has been started on the erection of the additions to the shops of the C. P. R. at North Bay, Ont., and among the buildings to be put up will be an erecting shop, with accommodation for the repair of ten locomotives, a car construction and repair shop and an additional machine shop.

Quebec, Que.—Fraser & Atkinson, engineers of the Transcontinental Railway Commission, have submitted to Mayor Drouin a copy of the contract between the commission and the city relative to the construction of the workshops at St. Malo. Mayor Drouin will study the contract with the city legal advisors, and it is expected the document will be signed in the course of a few days.

Vancouver, B.C.—Two contracts for steel bridges have been awarded recently to the Canadian North-West Steel Company. The first is for ten bridges on the Canadian Northern right-of-way. These will be of heavy plate-deck girder span type. The other contract is for a steel viaduct from the foot of Burrard Street to pier B, which is being erected for the C. P. R. as a direct means of communication with Hastings Street.

Toronto, Ont.—Plans for the new Union Station to be built in Toronto show that the building will be of white stone with steel frame and fireproof throughout. A network of subways will form the approaches to the trainsheds which will be connected with the passenger platforms by a number of freight and passenger elevators. Mechanical porters will eliminate the carrying of baggage and an elaborate system of baggage transfers will be installed.

Ottawa, Ont.—It is expected that within the next three months Grand Trunk Pacific passenger trains will be running between Montreal and Tete Jaune Cache in the mountains. The route from Montreal westward will be via Toronto, over Grand Trunk lines to North Bay, thence by the T. & N. O., over which the Grand Trunk has running rights, to Cochrane, thence over the transcontinental to Winnipeg, and for the remainder of the way over the Grand Trunk Pacific to Edmonton and into British Columbia. An alternative route will be provided from Montreal to Ottawa and thence over the old Canada Atlantic to Scotia Junction and Parry Sound.

Water Works

Port Coquitlam, B.C. — Operations were commenced on the installation of the Port Coquitlam $30,000 waterworks system here recently at a ceremony presided over by Mayor Mars. The water will be brought from the New Westminster main from Lake Coquitlam, and be distributed through local mains, the first of which was started on Railway Avenue 150 feet from the Pipe Line Road.

Tenders

Guelph, Ont.—The Sewerage and Public Works Commission will purchase a cement mixer.

London, Ont.—The steam plant of the London and Lake Erie Transportation & Railway Co. is for sale.

Toronto, Ont.—The city is in the market for a Pulmotor and steel boat for drowing accident rescue service.

Coaticook, Que.—The town is in the market for a steam roller, and tenders have been submitted by three firms.

Ottawa, Ont.—It is understood that only one tender has been received for the P. I. E. terminal of the I. C. R., which is from Albert Mackie of Toronto, associated with M. J. O'Brien.

Contracts Awarded

Ottawa, Ont.—The Government has awarded the contract for building a government drydock at St. Joseph de Levis, Que., to the firm of M. P. and J. T. Davis, Ottawa, for $2,721,116.

Edmonton, Ont.—The Cannal & Spencer Construction Co. has been awarded the contract by the city for the erection of a laundry and powerhouse for a hospital at a cost of $45,000.

Toronto, Ont.—The Temiskaming and Northern Ontario Railway are reported to have placed an order with the Pullman Co., New York, for two complete all-steel pasenger trains, to be delivered next year.

Fort William, Ont.—The Canadian Pacific Railway have awarded a contract to John S. Metcalf Co., Limited, Montreal and Chicago, constructing engineers, for extensive work in connection with the steel river house at Elevator "D," Fort William, Ont. Estimated cost is $45,000.

Ottawa, Ont.—Contracts awarded by the Government recently were as follows: The C. S. Boon Dredging & Construction Co., Toronto, gets contract for dredging at Collingwood to the extent of $549,560. The Soo Dredging & Construction Co. get dredging contract at Bruce Mines, Ontario, to the extent og $8,832. The Maritime Dredging Co. gets dredging contract at Digby, N. S., for $43,600. The T. A. Fowlie get dredging contract at Little Black River, N. B., for $11,095. The Maritime Dredging Co. get contract for dredging at St. Stephen, N. B., for $7,935. Contracts were also awarded to D. Jamieson & Son, for an electrical passenger elevator in public building at Sault Ste. Marie for $11,100; to G. C. Hurrell, Victoria, B. C., for construction of Observatory Building, at Gonzales Heights, Victoria, B. C., for $11,900.

Refrigesation

Medicine Hat, Alta.—A Creamery and Cold Storage Co. recently made an agreement with the city to build a plant costing $50,000.00.

The York Mfg. Co., York, Pa., report the following recent sales:—The Dominion Brewing Co., Toronto, Ont., one 40-ton horizontal double-acting belt steam-driven refrigerating machine and high pressure side complete; The MacKenzie Electric Co., Sarnia, Ont., one 1-ton vertical single-acting belt-driven enclosed type refrigerating machine and high pressure side complete; The T. Eaton Co., Ltd., Toronto, Ont., one 8-ton vertical single-acting belt-driven enclosed type refrigerating machine and high pressure side complete; also a 11-ton vertical single-acting belt-driven enclosed type refrigerating machine and high pressure side complete.

Miscellaneous

Hamilton, Ont.—The Dominion Railway Board will meet here in two weeks' time to attempt to reach a settlement between the C. N. R., G. T. R. and the T. H. and B. respecting an entrance into the city. The later are opposed to the entrance.

The St. Lawrence and Great Lakes Commission.—A water power commission is to be appointed by the Government to study the field of waterpower developement from the head of the lakes to Montreal. It is expected the commissioners will be Professor McLeod of McGill University, Arthur Surveyor of Montreal, and C. R. Coutlee of the engineering staff of the Department of Public Works.

Personal

R. W. Burnett, master car builder at the C. P. R. Angus shops, has been elected president of the Canadian Railway Club, Montreal, for the ensuing year.

T. Blundell Brown and E. Maes Harvey, of London, England, two members of the board of directors of the B. C. Electric Co., arrived in Vancouver last week.

Charles Murphy, general superintendent of Eastern lines of the Canadian Pacific Railway, has accepted the position of general superintendent of the Manitoba division, with headquarters in Winnipeg. He succeeds D. C. Coleman, who has been appointed to the Alberta division.

C. R. Burt, Rockford, Ill., has been appointed factory manager of the Russell Motor Car Co.. Toronto, in succession to K. B. MacDonald, who recently resigned. Mr. Burt brings to the company a complete experience in machine shop practice. He was for nine years with Brown & Sharpe, the celebrated machine tool manufacturers, Providence, R.I., first as foreman of their tool room, and latterly in charge of their gear and assembling departments. He visited Europe on their behalf to investigate comparative methods of manufacture in Europe and America. For the past eight years he has been general superintendent of the Barber-Coleman Co. plant at Rockford, Ill., manufacturing textile machinery, automobile machinery and parts. He thus brings to his new position a special knowledge of machine shop methods as practised in the best equipped shops of the United States. Mr. Burt will take up his new duties in August .

Trade Gossip

The Terry Steam Turbine Co., Hartford, Conn., have sold to the O'Keefe Brewery Co., of Toronto, Limited, a 25 H.P. Terry turbine-driven pump.

Marine

Montreal, Que.—The Harbor Commissioners have passed plans for the extension of the piers in the harbor.

Port Coquitlam, B. C.—A contract will be let shortly to deepen the waterway up the Fraser River to Port

Coquitlam, and which, within two months, will allow of the passage of ocean carriers.

New Incorporations

The White Rock Water Works Co., Ltd., has been incorporated in British Columbia to take over H. T. Thrift's water license at White Rock, B. C.

Calgary, Alta.—For the purpose and object of supplying the citizens of Calgary and the surrounding towns with pure, distilled water, a new joint stock company has been formed and incorporated under the name, Calgary Polar Water Company, Limited. The capital is $15,000, divided into $1,500 shares of $10 each. The directors are: Dr. F. H. Mayhood, M. H. O., Dr. C. F. McGuffin, W. A. Lewis, C. L. Turnbull, all of this city. The bankers are the Imperial Bank of Canada; solicitors, Clarke, McCarthy, Carson and Macleod and secretary and registered office, W. A. Lewis, room 404, Beveridge Block, Calgary.

Catalogues

The Slack Mfg. Co., Springfield, Vt., have sent us a leaflet describing the abrasive metal cutter manufactured by them. This machine is fitted with a special cutting emery wheel and will cut high-speed or carbon steel, bronze, etc., in any form. A copy of this leaflet may be had on request.

The Monarch Electric Co., Ltd., St. Lambert, P.Q., have sent us a copy of their latest list of electrical supplies. The catalogue describes and illustrates clearly the various types of electrical fittings and switches, etc., which they manufacture. It is a creditable production, and copies will be gladly sent to interested readers.

The Canadian Detroit Lubricator Co., Ltd., Walkerville, Ont., have published a new catalog No. 36L describing their "Bulls eye" locomotive lubricators and specialties. The lubricator is of the hydrostatic sight feed type, and is made in several sizes. A detailed description is given and each size clearly illustrated. Copies may be had by writing.

The Wiener Machinery Co., New York, have sent us a copy of a pamphlet which they have published recently. The pamphlet describes and illustrates clearly the "Oeking" triple punch and shear, the "Oeking" quadruple combination shear and the "S & N" gate, beam and angle shears, etc. Tables and illustrations are given showing the capacity and scope of these machines. A copy of this pamphlet will be gladly sent to interested readers.

Testing the Hardness of Metals and Its Advantages

By Frank Walker

The author of this article is well known to readers of Canadian Machinery through his contributions on Tool Steel, the Layout and Equipment of the Blacksmith's Shop, etc., and as his present effort deals with a kindred subject, what he has to say will, we believe, again be found interesting and educative.

OF the many properties possessed by the various metals and alloys used in machine construction, none are of greater importance than that of hardness. An accurate knowledge of the hardness of a metal or alloy is of the greatest value both to the designer and the builder of machinery, as from it deductions can be made concerning the ultimate behavior of the material under various conditions and circumstances.

Hardness has been defined as the property of resisting penetration, but there are other stresses to which the material may be subjected, the resistance to these stresses being also defined as hardness—namely, the resistance to tearing or tensile hardness; to rubbing, or abrasive hardness; the ability to return to its original shape after being forcibly deflected, or elastic hardness; and the ability to cut other materials, or cutting hardness.

"Hard" and "Soft" Comparative Terms.

It must be understood that the terms hard and soft are purely comparative. An architect may specify "hard wood" in certain portions of a building, but that wood is only hard in comparison with other woods, and is much softer than the steel tools by which it was wrought to shape. Every schoolboy knows that steel is harder than wood, but the question is, How much harder? Comparison can only be made by some method of testing and measuring.

The most primitive test for hardness was that of scratching or trying to scratch the surface of the hardened article with some material known to be harder, but that gave no absolute means of judging the comparative degrees of hardness of the scratcher and the scratched. No doubt many readers have seen a blacksmith test with a file the hardness of an axe that he has tempered, but how much harder or softer was the axe edge than the file? Or how much harder should the axe be than the wood it has to cut in order that it may carry a good lasting edge without snipping? It was the necessity of obtaining information like this which led to the invention of the various hardness testing and measuring devices, and in this paper the writer proposes to describe briefly the more commonly used of these devices, and also to show how the information obtained may be applied with advantage to machine construction and shop practice.

Hardness Testing Methods.

There are in general use four methods of testing hardness—Turner's scratching test, introduced in 1886; Keep's drilling test, introduced in 1887; Brinell's indentation test, introduced in 1900; and Shore's rebounding test, introduced in 1907.

Each of these methods has its limitations, and also it sadvantages, as will be seen by a general description of the principles of each one.

The Turner Scratching Device.

In the Turner scratching device, or Sclerometer as it is named, a weighted diamond-pointed instrument is drawn once backwards and once forwards on the same line over a polished surface of the material to be tested, and the measurement of the hardness is the weight in grammes (a gramme is approximately 1-28 ounce) on the diamond required to produce a scratch which is just visible to the naked eye as a black line on the polished surface, and can just be felt by a sharpened quill drawn over the surface at right angles to the scratch. This form of test is only applicable to such materials as can be polished to a fairly smooth surface, also the standard depth of scratch requires considerable experience to define.

Keep's Drilling Test.

In Keep's drilling test an apparatus causes a steel drill of standard size and hardness to make a definite number of revolutions while it is pressed by a standard force against the piece to be tested. The hardness is automatically recorded by a diagram on which a dead soft material gives a horizontal line, and a material as hard as the drill itself gives a vertical line, so that the hardness of the material being tested is shown by the angle of the line on the diagram, a material of medium hardness giving, of course, an angle of about 45 degs. This test is particularly adapted to all kinds of castings, but, as will be understood, cannot be applied to materials which are harder than the drill.

Brinell Indentation Test.

In the Brinell indentation test a hardened steel ball, 10 millimetres (0.3937 inch) in diameter, is pressed by a pressure of 3,000 kilogrammes (6,614 pounds) into the smooth face of the material when testing iron or steel, but when testing softer materials, a pressure of 500 kilogrammes (1,102 pounds) is used for 15 seconds. The hardness of the material is measured by dividing the pressure on the ball in kilogrammes by the superficial area of the indentation caused by the ball in square millimetres.

Expressed in formula $H = \frac{K}{d}$, in which

H=Hardness.
K=Pressure on ball in kilogrammes.
d=Superficial area of depression in square M. M.

This test is specially adapted for almost all materials used in engineering construction. It gives good results with woods, and has, since the introduction of light portable machines, become the most generally employed of all the testing devices.

Shore Rebounding Test.

In the Shore rebounding test, an instrument which has been named the "Shore" scleroscope, allows a small cylindrical steel hammer with a specially hardened point to fall on to the smooth surface of the metal to be tested, and the hardness is measured by the height of the rebound. The hammer weighs 2½ grammes (less than 1-10 ounce), and falls 255 millimetres (about 10 inches). Its striking point is a special diamond, annealed to withstand shocks, having an area of about 0.02 sq. inch. The hammer falls in a glass tube, in which it fits freely, yet snugly. This tube is divided into 140 spaces, which are numbered from the bottom upwards, and the number of the division, to which the hammer rebounds after its fall, represents the hardness of the material being tested.

This method is extremely simple and rapid, but it was not in its earlier stages altogether reliable, for experiments showed that the results varied with the size and thickness of the test piece, also with the manner in which the test piece was supported. Again, indiarubber gave a rebound equal to mild steel, and soft white pine wood a rebound twice as great as grey cast iron. At the same time, a comparison of results obtained from pure metals in their normal condition by this method with those obtained by the methods of Turner and Brinell showed a remarkable agreement. It would, therefore, appear that each instrument must measure the same property. Modifications and improvements in the more recent instrument have, however, now enabled it to be used successfully on a wide range of material, and in certain industries, notably automobile and tool making, it is considered by many to have no superior.

Applicability to Machine Design.

It requires but little reflection to convince one how important will be the proper application of the information obtained by those methods to shop practice. In practically every machine built, certain parts slide or revolve in contact with others, and it is of great importance that the cheaper and more easily renewed part should wear out first, especially should lubrication fail, and it is only by making that cheaper part slightly the softer that this result can be achieved. A little experimenting, testing and recording would enable an exact standard or ratio of hardness to be fixed, by which the danger of unduly wearing, cutting or scoring the more expensive parts of a machine may be minimised.

Another application of these methods has enabled us to determine the ratio of hardness of the cutting tool to the work to be machined. This, to give the best results, has been found to be 3 to 1, and has enabled tool makers to temper their tools with a certainty of obtaining from them the highest efficiency.

Application to Cutting Tools.

As an example of what may be accomplished along these lines there may be quoted the particularly interesting experience of a large firm of threading tool manufacturers in the United States. This firm had supplied to one of their customers a parcel of taps to be used in a turret lathe on very tough bronze. One of these taps turned out to be a perfect "jewel." It held out for 18 days at the rate of 10,000 holes per day, and was then returned to the makers with a request for more like it.

The manufacturers submitted it to a scleroscope hardness test, and then proceeded to make 50 taps from the same stock steel, and hardened to exactly the same value. The whole were then sent to the users with a request to put them to work and watch them carefully. Each tap proved to have the same efficiency as the "jewel," and the firm now undertake to produce the "jewel' variety of tap as a regular product.

Application to High-speed Steels.

Again, when applied to "high-speed" steels the hardness test is of great value. The efficiency of these steels depends largely on the fact that at temperatures at which carbon steels would lose their temper they retain a high degree of hardness. In their cold state, their hardness value is about equal to well hardened carbon steel, but the heat developed by high speeds and heavy cuts may succeed in lowering this hardness below that ratio of 3 to 1, which is necessary to do economic cutting.

It is quite possible to test high-speed steels for cutting efficiency under those temperature conditions which will obtain in actual practice by heating small samples of the steel in question to temperatures of from 600 to 1,000 degs. Fah., and testing for hardness at frequent stages. Thus the effectiveness of a steel may be accurately determined even before purchasing. In those engineering parts which are made from carbon or alloy steels, and hardened, tempered or annealed, such as gears, sprockets, balls, rollers and other bearing parts, the intelligent use of comparative hardness tests affords a certain means of obtaining the best results, and high-class manufacturers of these specialties are now among the largest users of testing devices in one or other of the forms described. Also, structural ironworkers and bridge builders are using them with success to determine if a material is too brittle to be trustworthy.

The scleroscope gives exceedingly good results with carbon, and is extensively used by electrical engineers to determine the suitability of dynamo and motor brushes for the particular work for which they are intended, and also to insure uniformity in lamp carbons.

Impending Tariff Changes in the United States

Many additions to free list which will interest Canadian Exporters. Terms of the new act as agreed to by the Democratic caucus and in which form they are likely to pass.

CANADIANS have reason to watch carefully the progress made with the new tariff bill of the United States. That measure has now reached the form in which it is likely to go through. It has been passed upon by the Democratic caucus, which means that numbers of the party in the Senate are committed definitely to the main terms of the Act, saving one or two unimportant particulars in connection with which independent action is reserved. The changes made by the Senate Committee on Finance place the following items on the free list:

Par.	Item.
401	Beet and cane machinery.
403½	Alizarin and derivatives.
404	Perchlorate of ammonia.
404½	Antimony ore.
416	Plain woven fabrics of jute.
427½	Blankets worth less than 40c per pound.
434	School text books and material for the blind.
450½	Cast iron pipe.
452½	Cement.
460	Creosote oil.
481½	Glaziers' diamonds.
486	Crude artificial abrasives.
492	Flax, tow and hemp.
496½	Fulminates.
496¾	Undressed furs.
505	Chip amber.
505½	Gunpowder.
515	Indigo color.
522	Pig, wrought and waste iron, slabs, blooms, etc.
534	Sole leather, harness, etc.
537½	Asphalt and bitumen.
559	Shoe machine needles.
580½	Photographic films, not exposed.
584	Cyanide of potash.
598	Santonin combinations.
609	Cyanide of soda.
615½	Steel ingots.
618	Strychnine compounds.
621	Cattle, sheep and other animals.
646	Wheat, flour, etc.
652	Goat hair.

This does not necessarily mean that these articles can be exported from Canada to the United States free of duty. Wheat, flour and bran, for instance, cannot be shipped to the United States free of duty so long as Canada's tariff wall against said commodities is maintained. Australia, Great Britain, or India, which import flour free may export the same to the United States. They can also export wheat to the United States free of duty. This will create a condition of affairs which will be awkward for Canada. As yet, however, the bill is not finally law. If it does become law in the present form it will certainly give rise to a tariff question in Canada that will have serious commercial as well as political consequences. The chief changes made by the United States Senate Committee, in the tariff bill are as follows:

CHIEF CHANGES IN U.S. TARIFF.

Par.	Item.	House Rate.	Senate Com. Rate.
	SCHEDULE A.		
1	Gallic acid	4c	7c
	Oxalic acid	2c	1½c
	Pyrogallic acid	10c	15c
	Tannic acid	4c	5c
6	Alizarin	10%	Free
14	Caffein compounds	20%	
15	Calomel	15%	20%
23	Creosote oil	5%	3%
	Amthracene oil	5%	3%
26	Pyroxylin	15%	25%
	Pyroxylin finish	35%	40%
37	Chicle, per lb.	20c	15c
	Dextrine (potato), lb..	¾c	1½c
46	Alizarin assistant	15%	25%
	Linseed oil, per gal....	12c	10c
	Olive oil, per gal.	20%	20c
53	Blues under 7c per lb..	15%	1c
65	Cyanide of potash.....	1½c	Free
68	Cyanide of soda, per lb.	1½c	Free
	SCHEDULE B.		
74	Cement	5%	Free
78	Asphalt, per ton	25%	Free
	Bitumen, per ton	50%	Free
79	Mica, per lb.	15-30%	4c-30%

87	Glass (small sizes), lb.	⅞c	1c
94	Glass strips	20%	25%
96	Opera glasses, etc.	30%	35%
	Telescopes, etc.	30%	25%
98	Glass enamel	Free	20%

SCHEDULE C.

104	Pig iron	8%	Free
	Wrought iron, etc.	8%	Free
105	Slabs, blooms, etc.	8%	Free
	Muck bars, etc.	8%	5%
106	Beams, etc.	12%	10%
107	Boiler iron	15%	12%
108	Anchors, etc.	15%	12%
	Hoop iron	12%	10%
111	Tin plates	20%	15%
	Steel ingots	15%	10%
113	Steel wool	20%	15%
	Grit shot, etc.	30%	25%
116	Coated wire	20%	15%
	Wire rope	30%	25%
121	Automobiles—		
	Worth under $1000.	45%	15%
	Worth $1000-$1500...	45%	30%
122	Motor cycles	40%	25%
125	Iron bolts	15%	10%
	Nut locks	35%	25%
126	Card clothing	40%	10-30%
127	Iron pipe	12%	Free
128	Chains	20%	25%
133	Files, machinery	25%	20%
	Files (hand cut)	25%	20%
137	Needles	25%	20%
144	Wheels	25%	15%
145	Aluminum (crude), lb...	25%	2c
	do plates, per lb.	25%	3½c
148	Bronze powder, per lb..	25%	8c
	Dutch metal, 100 l'ves..	25%	4c
152	Metal threads	30%	25%
154	Lead ore, per lb.	½c	¾c
164	Zinc ore	10%	12½%
	Pig zinc	10%	15%
169	Manufrs. of metal	25%	20%

SCHEDULE G.

188	Cattle	10%	Free
190	Sheep	10%	Free
196	Oats, per bushel	10c	6c
	Oatmeal, per 100 lbs.....	Free	33c
198	Wheat, per bushel	10	Free
200	Butter, per lb.	3c	2½c
201	Cheese, per lb.	20%	2½c
203	Beets	10%	5%
208	Frozen eggs, per lb. ...	2½c	2c
209	Dried blood, per lb...	1½c	Free
214	Peas, per bushel	15c	10c
	Split peas, per bushel...	25c	20c
	Peas in pkgs, per lb. ..	½c	1-3c
217	Flaxseed, per bushel ..	20c	15c
	Seeds in general, p. lb..	10%	5c
221	Fish	20%	25%
223	Currants, per lb.	2c	1c
227	Bananas, per lb.	Free	1-10 of 1c
233	Meat extract, per lb....	15c	10c
	Fluid meat extract, lb..	7c	5c

SCHEDULE I.

255	Cotton thread	5-25%	5-27½%
257	Cotton cloth	7½-27½%	7½-30%
260	Hdkchfs, unfinished	30	25
261	Cotton clothing	25%	30%
263	Jacquard goods	30%	35%
265	Hose	40-50%	30-50%
	Cotton gloves	35%	45%
267	Belting, etc.	15-25%	15-30%

SCHEDULE J.

272	Flax, per lb.	½ of 1c	Free
273	Dressed flax, per lb. ...	1½c	Free
274	Tow, per ton	$10.00	Free
275	Hemp, per lb.	½c	Free
276	Duke yarns	15-25%	20%
279	Flax yarns	15%	12%
280	Nets	30%	25%
281	Matting, square yards..	2½c	2c
282	Carpets	35%	30%
284	Tapes	25%	20%
287	Bandings	50%	40%
289	Hemp pile fabrics	45%	40%
290	Sackings	25%	10%
292	Woven fabrics	35%	30%
293	Damask	40%	45%

SCHEDULE K.

295	Wool tops	15%	5%
296	Yarns	20%	15%
297	Wool stockings	35%	15-50%
314	Goat hair	20%	Free
315	Goat hair tops	25%	5%
316	Goat hair yarns	30%	15%
317	Goat hair cloth	40%	35%
318	Velvets, etc.	50%	40%

SCHEDULE L.

319	Raw silk, per lb.	15%	30c
320	Spun silk, per lb.	35%	30-50c
	Plus No. per lb.		15c
321	Thrown silk, per lb.	15%	35c-$1.05
322	Velvets, per lb.	50%	$1.25-$3.25
	Plushes, per lb.	50%	$1.00-$2.00
323	Silk Handkerchiefs	40%	45%
324	Ribbons	40%	45%
327	Artificial silk yarns ...	35%	25%

SCHEDULE M.

332	Coated paper	35%	25-50%
	Basic paper	25%	15%
333	Pictures, cards, etc.,		
	per lb.	15-30%	15-40c
	Booklets, etc., per lb...	12%	7c
	Decalcomanias, per lb..	20%	60c

SCHEDULE N.

342	Hat braids	50%	40-50%
347	Buttons	40%	25-50%
351	Artificial abresives	10%	Free
353	Fulminates	5%	Free
354	Gun powders, etc., p. lb.	½-1c	Free
356	Percussion caps, per		
	thousand	75c	$1.00
358	Per undressed furs	10%	Free
	Fur articles	40%	35%
	Cattle fur	50%	15%
364	Fur hats	40%	45%
367	Glaziers diamonds......	10%	Free
	Marine coral	Free	10%
369	Chamois skins, etc.....	15%	10%
	Bags fitted	30%	40%
373	Women's gloves not		
	over 14 in., per doz..	$2.00	$2.50
	Men's gloves, per doz...	$2.00	$3.00
376	Harness, etc.	20%	Free
377	Mfs. of amber, etc.	10%	20%
378	Mfs. of rubber	10%	10-15%
380	Masks	20%	25%
386	Paintings, etc.	15%	25%
388	Pencils, per gross	25%	36-25%
390	Photographic material	20%	15% up
391	Meerschaum	Free	20%

PULPWOOD PRODUCTION.

A REPORT on Canada's pulpwood production in 1912, issued by the Forestry Department, shows that the forty-eight pulp mills reporting in 1912 consumed a total of 866,042 cords of raw material, valued at $5,215,582. The quantity consumed shows an increase of 28.8 per cent. over 1911, resulting in an increased value of the output by 20.12 per cent., in spite of a reduction of 43 cents per cord in the average price of the raw material.

Pulpwood Cut.

The total cut of pulpwood in Canada in 1912 was 1,846,910 cords, valued at $11,911,415. Of this total, 980,868 cords, or more than 50 per cent. was exported unmanufactured to the United States. Had these 980,868 cords been manufactured into pulp in Canada, the value would have been $13,220,684. The actual price received was $6,695,833.

Canada exported in 1912 enough pulpwood to supply 54 mills of the average size operating in the Dominion at present. Every province, with the exception of Ontario, increased its home consumption of pulpwood last year. The increases were:—Quebec, 48 per cent.; New Brunswick, 14 per cent.; Nova Scotia, 18 per cent. The decrease in Ontario was 18.6 per cent.

Local Manufacture.

In 1911, only 44.2 per cent. of the pulpwood cut in Canada was manufactured into pulp in Canadian mills. In 1912 this percentage was increased to 46.9 per cent.

MACHINE TOOL NOTES.

IT has been suggested on many occasions, says the Machine Tool Engineer, that a profitable piece of work for any machine shop would be a record of the time and money expended in repairing the various tools used, and the number of hours the tool was out of service due to repairs. By this means, it would be possible to make a comparison of the different machines used for the same kind of work, that, when ordering, some useful guide would be found in making the right choice or selection. This record would be very simply made, and would not involve any extra clerical work of importance.

Life of a Machine Tool.

The difficulty with the unpractised or unskilled and even the skilled person who controls a machine shop as an employer of labor, is to understand when it is time to consider a machine tool's profitable life at an end. The tool will probably last, to use a vague expression, for ever, that is to say, it will probably never fall to bits. and will always enable some kind of work to be performed upon it. Hence, though the machine may have been depreciated till it stands at nil in the balance sheet, it will probably be used for another twenty years, before serious thoughts are entertained of replacing it. Plenty of machines run thirty or forty years, and do their allotted jobs, so the employer does not think it worth while to get rid of them, but this seems to be a foolish policy.

Demonstrating the Points of a Machine Tool.

We agree with the view of a leading contemporary that every machine shop should keep one or more persons for "showing" the shop and demonstrating machines and their capabilities to probable customers. In many ways, a machine shop should be an advertisement for its production. To a skilled inquirer, who walks round the shop to see how things are done, the lack of system or the appearance of want of organization may give a poor impression as to the quality of the work turned out. A good demonstrator will be able to expatiate upon interesting points in design, upon possibilities in manufacturing processes, but he must not be a talker only, but a man who can talk with a degree of authority based upon personal knowledge and experience.

Plenty of shops do not use the tools which they make, for performing in their own shops the very operations for which such tools are designed. To give a demonstration, it is necessary to get a special tool ready. This does not seem to speak well for the firm's faith in the economy effected by using the tool. The demonstrator would have a poor time, if he began speaking of the economy effected being sufficient to warrant the scrapping of the old type of tool for the particular purpose and submitting his firm's special tool.

The Theory and Practice of Screw Cutting on the Lathe

By J. Davies

The author of this series of articles intimates his intention of making the information sufficiently simple and clear, that apprentices and others with the four rules of arithmetic at their command will be able to intelligently grasp the data and apply it in practice.

HAVING determined the ratio, a number of different sets of gears may be found by multiplying the ratio by any number we choose, although care must be taken to multiply both numerator and denominator by the same figure, so as not to alter its value. Examples:

Find wheels to cut 4 threads per in. with a leading screw of ½ in. pitch.

Threads ¼ in. pitch of leading screw ½ in.

Invert pitch of lead screw and multiply, then $\frac{1}{4} \times \frac{2}{1} = \frac{20}{40}$

Find wheels to cut 3 1-7 threads in 2 1-5 inches, with lead screw ½ in. pitch.

$\frac{\text{Inches } 2\ 1\text{-}5}{\text{Thrds } 3\ 1\text{-}7} \times 35 = \frac{77}{110} \times \frac{2}{1} = \frac{144}{110}$

Divide both numerator and denominator by 2 to reduce the size of the gears, then 72-55 will be the wheels required.

It very often happens that a lathe has a gear wheel permanently or tightly keyed on to the spindle, and which would be troublesome to remove. It is seldom necessary, however, to remove this gear, as other gears can be got to suit it as follows:

Find wheels to cut 10 threads per in., leading screw 4 threads per inch, with a permanent 30-tooth gear keyed to the lathe spindle.

Find ratio as before, $= \frac{1}{10} \times \frac{4}{1} = \frac{4}{10}$

$\frac{4}{10} = \frac{30 \text{ permanent wheel.}}{x \text{ or wheel required.}}$

4 x = 300 x = 75, therefore, wheels required = 30-75.

In changing the lathe from one pitch to another, it is easier and quicker to put down a few figures and work in as many of the same gears as possible, than to strip the lathe and put on an entire new set. Sometimes you will meet with a lathe that has a gear keyed on the spindle inside the end bearing, meshing with another gear which runs on a spindle through the frame.

As these gears are practically fixtures, they are invariably made a definite proportion to each other, usually 2 or 3 to 1.

In cases of this kind, multiply number of threads per inch in the leading screw by the ratio of the fixed gears. That is, supposing your lead screw has 5 threads per inch, and the ratio of fixed gears is 2 to 1, then figure the fixed gears and assume that the leading screw is 10 threads per in. and work out as before.

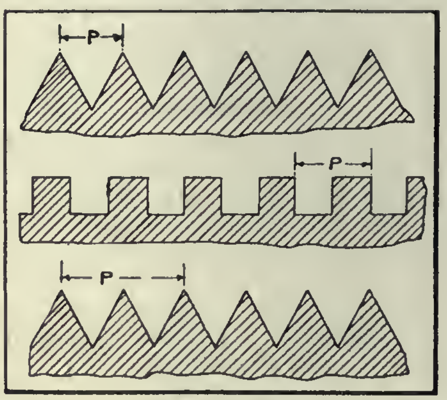
Compounding the Gears.

Sometimes it happens that the number of teeth in a wheel would be too large to employ a single train; in this case, compound gears must be used.

Example, it is required to cut 24 threads per inch with a leading screw ½ in. pitch. Proceed to find ratio as before.

$\frac{\text{Inches } 1}{\text{Thr'ds } 24} \times \frac{2}{1} = \frac{2}{24}$

Take the numerator of the ratio and find any two numbers which multiplied together will equal that number. Then



PITCH DIAGRAM.

take the denominator and find any two numbers which multiplied together will equal that number .

$\frac{2}{24} = \frac{2 \times 1}{12 \times 2}$

Having divided the ratio up into 4 factors of the same value, we can now multiply, divide, add or subtract at will, so long as we do not alter the relative values, therefore, in adding or subtracting, care must be taken that the amounts added or subtracted are the same proportionate amounts of each, such as ½, 1-3, ¼, and so on as the case may be. Take the first two figures our example and multiply each of them by ten. We have $\frac{2}{12} \times 10 = \frac{20}{120}$. Take again, the second figures and multiply by 50, then $\frac{1}{2} \times 50 = \frac{50}{100}$, and the wheels required are $\frac{20}{120} \times \frac{50}{100}$.

The top wheels are drivers, and the bottom driven.

Prime Number Method.

If the thread to be cut is exceptionally difficult, or if you are doubtful as to whether you can get any combination of wheels to cut the pitch required, try this method of using prime numbers.

Prime Numbers, 1 to 500.

1	71	167	269	389
3	73	173	271	397
7	79	179	277	407
11	83	181	281	409
13	89	191	293	419
17	97	193	307	421
19	101	197	311	431
23	103	199	313	433
29	107	211	317	439
31	109	223	331	443
37	113	227	337	449
41	127	229	347	
43	131	233	349	
47	137	239	353	
53	139	241	359	
59	149	251	367	
61	151	257	373	
67	157	263	379	
	163		383	

KAMINISTIQUIA POWER DEVELOPMENT.

INTERVIEWED by the Fort William Times-Journal, Mr. R. S. Kelsch, consulting engineer, Montreal, stated that his recent visit to Fort William was in accordance with instructions from President Holt of the Kaministiquia Power Co.

Owing to the general conditions throughout the country, it was felt that the company should, if found advisable, carry out as much as possible any contemplated constructions, during the next twelve to eighteen months, while the financial stringency was general and for that very reason, where work would be slack elsewhere and factories not running up to capacity, the plant could be installed at a very material saving and economy over what it could be done for two or three years later.

Making Surveys.

At the present time the company are making preliminary surveys, putting camps in shape, and in general anticipating an order to go ahead as soon as Mr. Kalsch can submit his report on the engineering advantages and dependent on Mr. Black's recommendations.

It will be appreciated that under existing financial and general conditions the company will hardly proceed with the outlay of such a large expenditure of money as would be involved in the carrying out of the proposed plans except after the most careful considerations.

With reference to the size of the new units, these would either be two of the same size at the present, viz., 5,000 horse power, or else one single unit between 10,000 and 15,000 horse power, whichever appears most advisable.

In the face of power failures elsewhere it is being better generally realized that where a community depends to such an extent as it does on electric service, the most important factor is that of continuity of service.

The Hydro Failure.

In the case of the recent unfortunate mishap to the hydro service in eastern Ontario it has been estimated that the loss to the community served, in lost time and inconvenience, to the public, was upwards of one hundred thousand dollars, and this feature must ever have the very best and closest attention of our consulting engineers, our operating organizations and our directors, having a proper regard for the public they serve.

While the present work is somewhat in advance of the immediate necessities, it but carries out the past policy of the company, to at all times maintain ample reserve equipment and assure the best possibly service.

Take Pride in Plant.

Mr. Kelsch referred to Mr. Holt's pride in their Kakabeka Falls plant, which Mr. Holt considers one of the very best of its kind and size anywhere on the continent, and holds the record for that standard of service which they have endeavored to secure. It is interesting to note that the management and local organization is practically the same as that from the commencement of operation in 1906.

It has always been the policy of the company to promote its men in the service, and to become a live factor in the life of the community which they serve.

Loyal to Fort William.

All their work is carried on by the company, supplies purchased locally as much as possible, and as all moneys are paid through the Fort William office, the expenditure that would take place would be of as much direct benefit as though the work were carried on inside the city limits.

While the company were preparing all the preliminary work and estimates no work on a big scale would be undertaken until their information was all in hand, nor would any definite decision be made until the return of W. A. Black, the managing director of the company, who is at present on his way from Europe, and is expected in Fort William in the course of the next couple of weeks. On Mr. Black's recommendations or otherwise will practically depend what the ultimate decision will be, but if favorable then the company would press forward all extensions as fast, and on such a scale, as the various conditions warranted during the next two years.

SCIENTIFIC SELECTION OF FOREMEN.

HARMONY between man and boss depends upon the proportion and nature of the positive and negative elements of character in each. An extremely positive boss will not work harmoniously with either extremely postive or extremely negative men—and conversely. As to disposition, there are several types of executive, two of which, very commonly met with, may be analyzed as follows:

Positive—or Driving.	Negative—or Drawing.
Keen	Mild
Quick	Deliberate
Domineering	Persuasive
Changeable	Constant
Impatient	Patient
Opinionated	Teachable
Excitable	Calm

The positive driving type, if given men of his own degree of positiveness, will arouse antagonism and insubordination. The negative type, if given men of his own disposition, will fail to arouse enthusiasm and stimulate action. Give the positive boss men several degrees more negative than himself, and the negative boss, men several degrees more positive than himself, then the result is harmony. Educate the boss, in addition, to apply the principles of efficiency to the job, and the principle of character analysis to his men, and the problems of management are solved. This is the ideal.

In practice it is slow work to enter an organization already established and adapt these principles—and plans based upon them—to conditions and traditions. In a large manufacturing plant, employing about 2500 men and women, we have been striving toward this ideal for six months. The results obtained are good, but as yet far short of our ultimate expectation. Certain small economies have, however, been effected in all parts of the plant to inspire us to continued and greater effort.

A Concrete Example.

One example, taken from our experience in connection with the crudest labor in the organization, will suffice. When we began work, the yard gang of 123 men was commanded by a brilliant, dashing, intensely likable young foreman who, because of these qualities, was popular throughout the organization, and held the confidence of his superiors. Coming under observation of one of our experts, he was reported to be unreliable and undesirable in several respects. Careful investigation of his department revealed many irregularities.

A successor was scientifically selected and assigned for this work, and, through co-operation with the efficiency department and executives of the company, he effected the following economies: During the last three weeks of October, the former foreman kept an average force of 123 men, with an average payroll of $1,823.46. The production consisted of heavy machinery, an average output of 62 units a week. During the last week in January, after the new foreman had been in charge three months, the average number of men was 51.8, and the payroll for the week $639.25. The production was 122 units; the reduction in cost per unit was therefore $28.53. The actual payroll during the last week in October, 1912, was $1,688.30. The actual payroll for the last week in January, 1913, was, as I have said, $639.25, showing a reduction in the payroll per week of $1,049.05.

If the present efficiency is maintained for a year, the economy effected, in this one department, will amount to $54,550.60, and the production, if maintained at the present rate, will be practically doubled. Since such economies can be effected through scientific selection and assignment in the lowest and cheapest grades of employment, what can be, and is being done with higher executives and more skilled labor by the same methods is so revolutionary that I dare only challenge your imagination as to facts and figures.

Observations from an address delivered by Dr. Katherine M. H. Blackford of the Emerson Co., before the Western Economic Society, Chicago, and which appeared in a recent issue of the Iron Age.

INTERNATIONAL STEEL CORPORATION LTD.

Letters patent have been granted incorporating the International Steel Corporation, Ltd., with a capital stock of $100,000, and head office at Toronto. The incorporators include D. A. MacRae, T. W. Lawson, H. E. McKibuck, barristers.

Discussion of Some Phases of the Efficiency Movement

By Staunton B. Peck*

There is no gainsaying the fact that the efficiency movement has come to stay, and that its operation and ramifications are contributing to high degree results. Its progress and development are shown by the writer of this paper to be dependent on a combination of conditions in which employer, superintendent, foreman and operator must each and collectively bear a part.

EFFICIENCY results essentially from analysis and close attention to details; but here I will only touch upon some of the more general phases of the subject.

The development of the highest efficiency is the purpose of Scientific Management, a subject much discussed and written about, but still very imperfectly understood. Two very widely divergent ideas are generally prevalent; one that all systematic plans of increasing efficiency are more or less impracticable theories involving much expense, disorganization and red tape; the other that efficiency and increased profits follow in some rather mysterious fashion as the result of putting in force a code of rules,—as one would benefit from following a system of calisthenic exercises. These views divergent as they are, have both received justification by the crop of efficiency and system experts, with little or no practical experience, who have sprung into existence in the last few years; and unfortunately, too, from some who have a real practical knowledge, but who lack commercial sense; and in their zeal to develop the highest productiveness, lose sight of the all-important fact that the aim of every business man is to make a profit.

The Taylor System.

The evolution of a better, or more correctly speaking, the best system of production, was begun some thirty years ago by Mr. F. W. Taylor. The progress for a long time was slow, attracting but little attention, for he sought to establish definite facts with characteristic patience and thoroughness. Any discussion, therefore, of the principles of efficiency involves the consideration of the "Taylor System," or Scientific Management as he prefers to have it called, because Mr. Taylor was the first to go to the root of the matter, covering the ground exhaustively, and, in fact, occupying the same position in relation to it that Darwin does to the Science of Evolution. All other plans are based on Taylor, however much they differ in their development.

Inadequate Supply of Unskilled Labor.

The widespread interest in the subject in the last few years has undoubtedly been stimulated by the inadequate supply of skilled labor—a condition never more apparent than at the present time, and particularly in the foundry, and without analyzing all the reasons for this, we do know that in this country the skilled artisan, instead of seeking to bring up his son to excel in his trade, aspires to have him follow what he falsely conceives the higher occupations of office, drafting room or counting room, where he can have clean hands and wear a white collar. This scarcity of labor leads us naturally to endeavor to get the greatest efficiency out of what is available. There can be no doubt of the desire of every manufacturer to realize a high degree of efficiency in his plant, and every one has sought to attain it—some consistently, but most of us in a more or less uncertain and rambling fashion.

Degrees of Efficiency.

The same degree is not possible to all as the nature of the product will determine. Where there are relatively few things made, but these are made in large quantity, a greater measure is possible than where the product is greatly diversified. While relatively few plants may advantageously adopt comprehensively the Taylor System, a thorough study and grasp of its fundamental principles by those in authority, will unfailingly result in a broader and wiser policy; for these principles are universally applicable; and there are few plants that cannot make advantageous practical use of some of the methods of increasing efficiency growing out of them.

The value of some of these methods has long been recognized, and has led to their adoption in many plants. Particularly is this true of the incentive schemes for paying men,—variously known as piece work, premium and bonus plans. To many, this is the main and all important element in efficient management; neverthelsess, this element is relatively unimportant; and not only this, but time and motion studies, divided or functional foremanship, accurate cost and stock keeping plans, and all of what may be called the machinery of the system.

The Co-operation Feature.

Between this machinery and the real system itself, there is a clear and positive distinction which is not generally appreciated by many who are fairly familiar with the practical methods, and which, if not clearly kept in mind, is and has led to failure, discouragement and abandonment of attempts at betterment. This essential feature which must exist in the system which aims at the highest efficiency, is a spirit of friendly co-operation on the part of both workman and management—a real belief which manifests itself by act, on the part of each, that there is no antagonism between them, but that they have a common interest, and that they are indissolubly bound together in success or failure.

Now I think we all of us know that before this feeling exists, there must be a complete mental revolution on each side; for even although the relationship between men and management may be friendly and even cordial, the universal feeling up to the present time has been that their practical interests were of necessity antagonistic. There is no doubt of the general prevalence to-day of an innate, perhaps, partly unconscious desire, on the one side to get the most return from the workmen for the lowest wages, and on the part of the worker to give the least return. These mental attitudes are the development of generations under the old system, and are so thoroughly widespread and ingrained, that only by patient and persistent effort can they be changed. In such measure as this new mental attitude exists on both sides, can the greatest efficiency be realized.

Traditional Methods and Individual Opinions.

The second fundamental principle of Scientific Management is the recognition and acceptance on both sides of the fact that exact knowledge of the manner and time in which work should be done, must replace traditional methods and individual opinion of either worker or foreman. All the disappointments at failure to realize anticipated results from the adoption of better methods, can be directly traced to imperfect appreciation of one or the other or both.

As I have said, the element of efficient operation of which there is the most

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general knowledge concerns the manner of paying the workmen; and the first step usually undertaken towards increased efficiency, is the introduction of some one of the piece rate plans, or plans where an increased production by the worker earns increased pay. Now unless what constitutes a fair days' work is based on accurate knowledge of the machine or tools with which the man works, and the motions he uses to accomplish his work, the task set is going to be wrong in the majority of cases. This knowledge can only be obtained by the thorough study of the tools by trained men to be sure that their various functions are properly co-ordained, and to determine their capacities; and by a large number of time and motion studies, with stop watch, of the men, for the purpose of eliminating the useless or waste motions, and obtaining records that are fair to the average worker.

Impatience to Attain Results.

The criticism that I think may be broadly made of American factories is a certain impatience, an over-intensity and eagerness to attain results, which causes lack of thoroughness. This is but a natural result of our phenomenal prosperity, and a desire to make the most of our tremendous opportunities in the shortest space of time. Those of us who are willing—and many are not—to bear the expense of the proper preparation of data necessary to the introduction of efficient and permanent incentive wage systems, still begrudge the loss of time required to do it.

Now, if these piece-rates—I use this expression in a general sense to cover all these wage plans—are not right, two results follow, or rather one result—inefficiency—from two causes. If the day's task is too easy, the workman earns too much, until the management cuts the rates, and then systematic soldiering follows thereafter throughout the plant, to avoid earning excessive wages, and to conceal the errors in rates. If the rate is such as to call for an excessive or impossible effort to earn a premium, no incentive is offered, and all attempt ceases. Both results foster the sense of antagonism on the part of t' worker, fatal to any spirit of co-operation. The attainment of efficiency in production is shorn of its fruits, if unaccompanied by a corresponding efficiency in the sales organization. No single factor is of more value in promoting this than correct and dependable costs records; and these result automatically where correct piece-rates have been put in use that are properly determined and known to be absolutely right.

The Foreman A Co-Worker Feature.

Following a mental attitude on the part of management and worker which makes both fellow workers to a common end, and the acquired knowledge of the best methods of operation, there results naturally the effort on the part of the management to impart this knowledge to the workman and assist him in every possible way to work to the best advantage. This subordinates the idea of the foreman or superintendent as a boss or driver, to that of a teacher or co-worker. Such relation may often be found in a small factory, where the owner or boss is a practical man, and every one is under his immediate eye and direction. His methods may be fairly efficient, because the operations are so comparatively few that experience has supplied him with reasonably accurate data not beyond the capacity of his memory to record.

A general foreman, or superintendent, however, is called upon for a number of duties which are radically different in character and which are rarely performed equally well. He has to hire, discipline and discharge men; (an old New England Superintendent said half the art of management was in hiring and half in firing); to direct the men in their work, and the actual factory operation; to be the inspector; to assign the work and keep track of its progress through the factory; to look after the physical condition of the plant and equipment, and the expansion of both.

Small Shop Growth.

The first loss in efficiency then usually begins when the small shop which has been well-handled begins to grow as a result, and its management gets beyond the capacity of one man. As I have said, the superintendent rarely performs all of his various duties equally well. If he is of a methodical temperament, his keenest interest will be centered on planning the distribution of the work, its progress through the factory, and its completion by the shipping date. If he has a distaste for such work, he will naturally prefer to spend most of his time on the floor directing the actual operations. In either case, with the growing business, one or the other is neglected. Mistakes and poor work results in one case, and delay and confusion in progress of the work in the other.

The Superintendent Feature.

The customary step toward keeping up the efficiency of the growing plant is to provide the superintendent with an assistant, usually a younger man who has all the qualifications of the superintendent, but presumably in a lesser degree, and who performs all the same functions, merely relieving the superintendent of the less important details of each. The better plan, however, is a definite division of the superintendent's functions among as many different assistant superintendents or foremen as the size of the business will justify. If this course be followed, the big concern is in the way to become the most efficient one.

That the opposite is frequently the case is because with rapid expansion the management gets further and further from the shop, and endeavors to bridge the gap by superintendents, assistant superintendents and general foremen, each required to have knowledge of a great many things, but not a specialist in any one. This may result in output, but not efficiency. The latter cannot be secured by a large number of superintendents with general knowledge, but does result from foremen with highly specialized restricted duties, each one being chosen for his natural interest and aptitude in his particular field.

There is frequently encountered a serious obstacle in the opposition on the part of many a capable superintendent and foreman, who openly or secretly resents the relinquishment of any of his functions, feeling his position and authority are thereby lessened, yet, to the average busy superintendent, if he can be made to view the change in the right spirit, the assistance, for example, of a production clerk who assumes the entire responsibility for the distribution of the work and following it up, is a vast relief and an aid to efficient effort in his other duties. So, too, for example, the foundry superintendent's efficiency may be increased by relieving him, where the growth of the output permits, of all responsibility for the mixture of the iron and the melting.

It must be remembered that true scientific operation imposes definite responsibilities in the matters of co-operation, investigation and instruction on the management, to which the same consistent obedience is required as of the worker to his duties. If those in authority chafe under this and fail to do their part as faithfully as the men the efforts of the latter will proportionately fail to achieve results. It may safely be said that opposition wherever found is due to ignorance.

We read a great deal about the high cost of living, and get a very practical reminder of this every month. We read many explanations, and not so many suggested remedies. Those of us who know something of labor conditions, I think, agree that the most important contributing factor is the persistent pressure of the labor unions toward high wages, shortened hours and restricted output. The leaders of these unions will not permit themselves or their followers to see that labor enters largely into every product that labor itself has to buy, and that every decrease in efficiency and increase in wages keeps working in a cycle to increase the cost of the necessities of life. The only practical way to decrease living costs and to enable the workman's wages to buy more is increased efficiency of all his fellow-workers. The more economically an article is produced, the more people can use it, the greater the demand for its production, and the more producers required. This is in direct variance to the short-sighted but general belief of the working man, that the demand for any article is fixed, and that the less each man does the more men are employed. There is no fixed demand; on the contrary, inefficient labor by increasing costs decreases the demand and throws men out of work.

A Matter of Education.

Education, therefore, in correct economic ideas, which is best brought about through fostering the co-operative spirit throughout a concern, is a sure step toward ultimate efficiency, and it is to be regretted that many influential in various walks of life—Congressmen, writers, pastors and others, who occupy a natural and outside position, do not give more thought and study to acquiring and disseminating correct ideas. The good they could accomplish is incalculable, but, unfortunately, most of them never go beyond the superficial conception that the interests of laborer and employer are essentially antagonistic, and that all attempts at increasing efficiency are but means to grind the last ounce of effort out of the worker, to his mental and physical destruction. Those who are practical students of efficiency know to the contrary that its highest attainment comes from men working well within their capacity, and that periods of rest depending on the character of the work are as essential and as definitely provided for as the periods of work.

It should be kept in mind that, while the operations of the efficient worker may be made as regular and uniform as that of a machine, no man is a machine merely; and even the least intelligent have human feelings and desires which demand not merely the physical necessities of a roof, a bed and three meals, but some of the good things of life as well. As this human element enters into the wages, therefore, and must be paid for, it is a waste product unless the employer can find some means of utilizing it. There can be no outlet so mutually profitable as converting it into pride in work well done, and a spirit of co-operation and loyalty, by safe, sanitary and comfortable surroundings, a touch of skilled and cheerful assistance in aiding the performance of duties, and personal interest and appreciation from time to time on the part of those "higher up."—From a Paper read at the National Founders' Association Convention in New York.

BURNING ANTHRACITE DUST.

THE usual practice when burning anthracite dust in connection with bituminous coal is to use a certain number of barrowfuls of dust with a given amount of soft coal, the proportions being varied in different places, and depending almost entirely on the experience of the fireman or engineer. Where the boilers are hand-fired, two or three barrowfuls of soft coal are dumped on the boiler-room floor, and over this is spread one or two barrowfuls of dust, the shovelling of the mixture into the furnace being depended upon to form a more intimate union of the different grades of coal. In some cases water is sprayed over the mixture before it is fed to the furnace.

There is no hard-and-fast rule as to the amount of water to use in wetting down the pile of dust, but it will be found that the mixture when wetted before being fired is better enabled to hold a lump shape, and this permits coking, which produces a more favorable condition for burning the dust. Whenever the mixture is fed to the furnace dry, there is little tendency toward coking; hence a smothered fire is produced, and poor combustion is the result.

It is evident, therefore, that the object of wetting the dust is to produce a lump formation which will facilitate coking. The best proportion of dust to use with soft coal is one that will effect a rapid dissipation of smoke, and at the same time maintain satisfactory steam pressure.

GERMANY'S TRADE.

GERMANY has made prodigious strides in commerce and industry since 1888, and much statistical information showing these increases has been published in connection with the celebration of Emperor William's quarter century on the Throne. It is now claimed that Germany is ahead of England as a producer of merchandise.

In the last twenty-five years, Germany's imports have risen from $818,000,000 to $2,541,000,000, and her exports from $798,000,000 to $2,146,000,000. This foreign business affected shipping as follows:— Tonnage movement in 1888, 42,000,000 tons; in 1912, 137,000,000. Coal, including lignite, was produced in 1888 to the extent of 81,000,000 tons; in 1912 the figures showed 259,000,000 tons. Crude iron produced in 1888, 4,300,000 tons; in 1912, 17,800,000 tons. Imports of raw cotton show equally interesting figures: 913,000 bales in 1888, as against 2,276,000 bales last year.

Germany's great electrical industry has almost been created during the past twenty-five years, and the leading electrical manufacturing company of the country has increased its capital strength more than twenty-fold since 1888.

DURABILITY OF TIES.

THE average life of untreated ties as reported by the steam roads is as follows:—Cedar, 9 years; tamarack, 8 years, hemlock, 7 years; Douglas fir, 7 years; jack pine, 6 years; spruce, 6 years. As recent statistics bear evidence, cedar is the species principally used, because of its durability, but the supply of cedar is rapidly becoming exhausted. Unless preservative treatment of ties is introduced, the short-lived species will have to be used untreated, which, on account of the necessary frequent renewal, will increase the cost of mileage maintenance. If treated ties were used, which would cost 30 cents extra per tie for creosoting and equipping with tie plates, the inferior species, which are very plentiful and cheap in Canada, could be used with economy.

With such a treatment, these woods would last at least 15 years, and if protected from wear would probably last much longer.

SQUIRREL CAGE TYPE MOTOR.

THE squirrel-cage type motor easily holds the field for general work in the cement mill. A good method is to have a combination of group and individual drives, grouping all the heavy machines and using small motors for the lesser drives, such as conveyors, elevators, etc. The choice of frequency is not of very great importance; anything between 25 and 63 periods is suitable. Of greater importance is the choice of voltage.

With group driving, the 2,200-volt system can be installed to great advantage with perfect safety, but such is not the case with individual driving. The smaller machines should be driven at 550 volts as a maximum. The wiring is best carried out in the open principle, with everything in full view, this system being carried right up to the motor wherever possible.

New Development in Molding Machines for Shallow Work

."Engineering"

With a view to meeting the special conditions imposed by shallow work, the machines here described have been introduced, and as a large section of our readers are engaged in this particular line of product, we are of opinion that the data given will be found specially interesting.

THE moulding of shallow work, especially round and oval pieces of small dimensions, such as fittings for saddlery, small rings, etc., and the moulding of rather large sections, consisting of numerous small parts, such as stove plates and other ornamental work, offers difficulties of a special character. For this class of work it is necessary to do away almost entirely with the joint fin, owing to the practical impossibility of chipping every casting. It is consequently of the first importance that the two half-moulds should be in perfect match. Shallow work can be made by hand processes at quite a fair speed and of good quality, so that if machine processes are to compete it is necessary that they should afford a rapid output and a good quality of work.

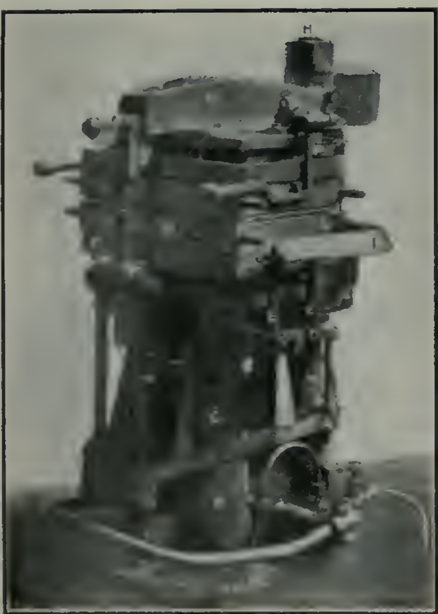


FIG. 1. MACHINE CLOSED FOR RAMMING.

Existing Methods Have Disadvantages.

There are numerous machine methods at present in use for the production of the shallow type of work with which we are dealing, but we think none of them can be said to be so perfect as to have no disadvantages. For instance, when moulding with separate pattern-plates for the cope and drag, it is extremely difficult to obtain a perfect match, while with a power squeezer the plates have to be made strong enough to withstand the whole pressure of the machine. A common method of working is by means of loose patterns on a sand match, but this is only practicable for simple classes of work. A feature of many methods of machine-moulding shallow work is that pouring has to be made on the flat. In many cases, however, it would be an advantage to be

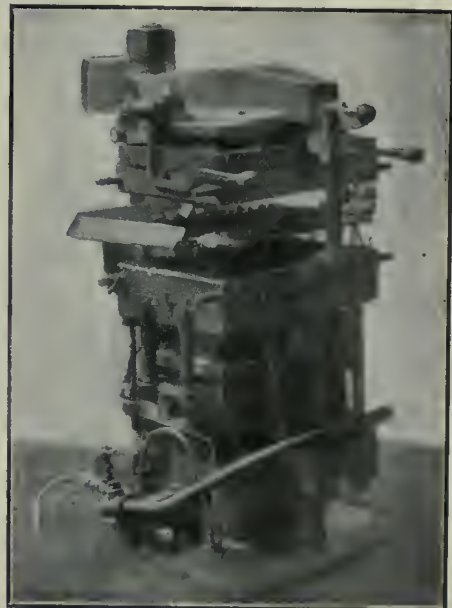


FIG. 3. MACHINE WITH DRAG LOWERED AFTER RAMMING.

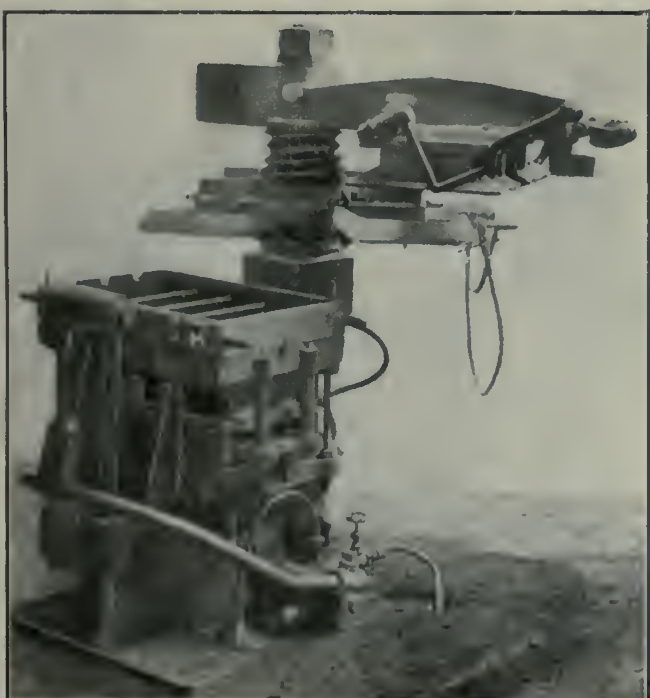


FIG. 2. MACHINE OPENED OUT FOR FILLING FLASKS.

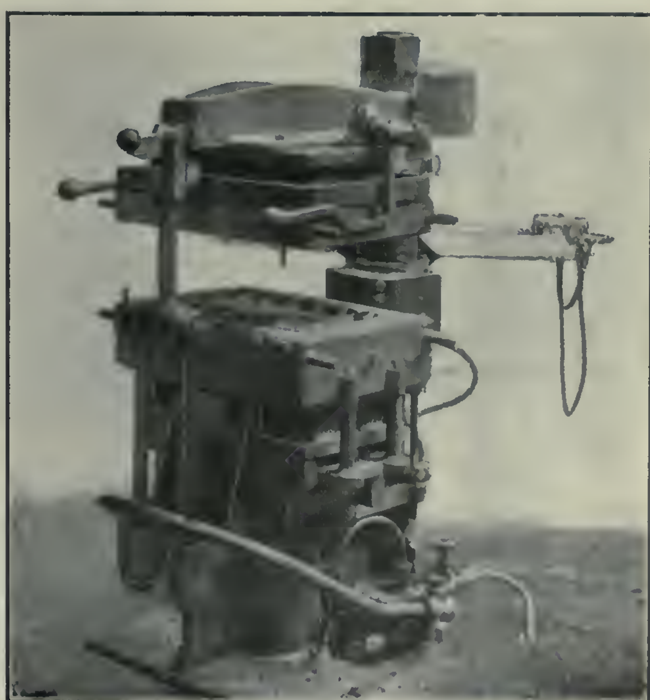


FIG. 4. MACHINE WITH PATTERN PLATE SWUNG OUTWARDS, READY FOR CLOSING MOLD.

ablo to pour such castings on end; but apart from anything else, it is clear that this would frequently allow more castings to be put in a flask than is possible with flat pouring.

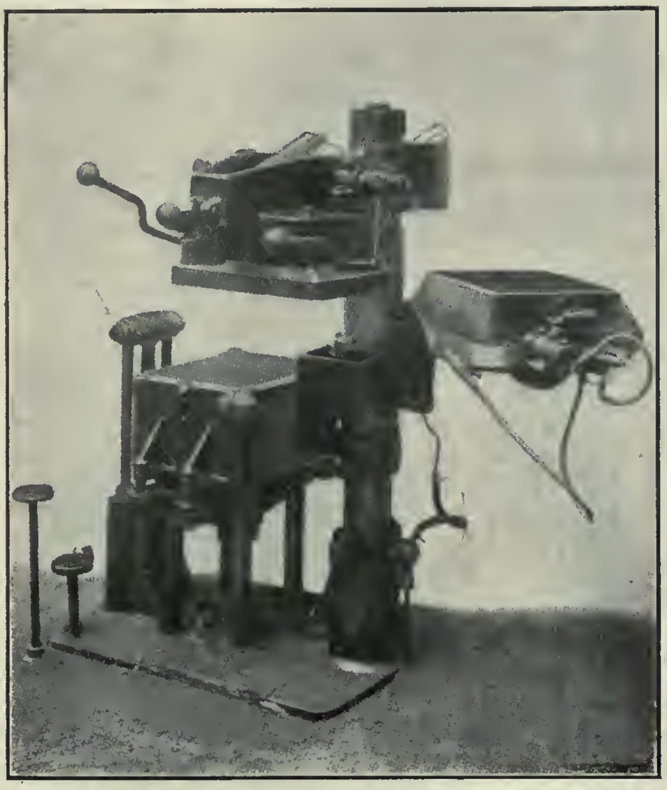


FIG. 5. MACHINE IN POSITION FOR FILLING FLASKS.

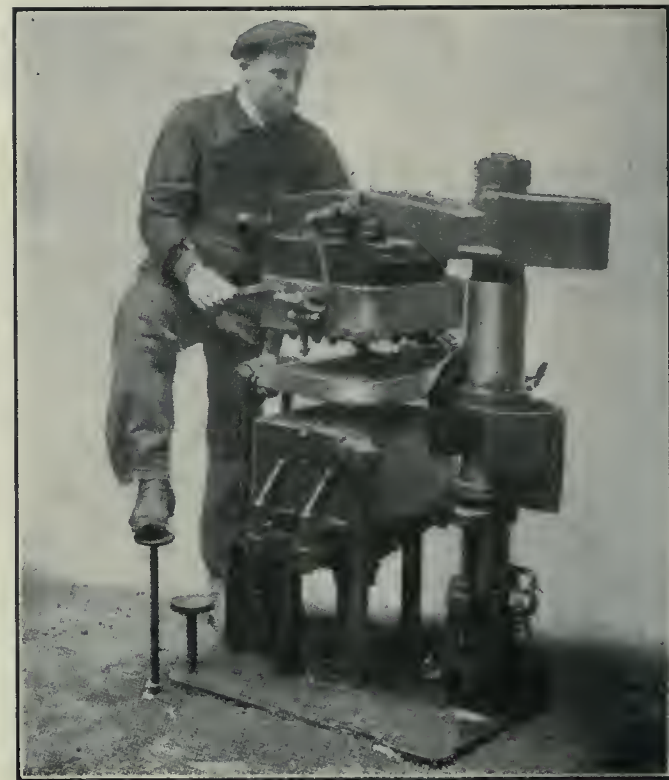


FIG. 6. PATTERN BEING DRAWN WITH VIBRATOR IN ACTION.

White Metal Pattern Plate Feature.

With a view to meeting the special conditions imposed by shallow work, the Societe Anonyme des Etablissements Ph. Bonvillian et E. Ronceray, of 9 and 11, Rue des Envierges, Paris, have introduced the machine here illustrated, the main features of which are that it is arranged so that both flasks can be filled simultaneously, and can be rammed together by a single stroke; that the pattern is drawn by the machine while the plate vibrates; and that it is possible to close the mould either for pouring on the flat or on end. Further features are that the machine is adapted for barred flasks, and can be used in connection with white-metal pattern-plates of about ½ in. thickness, which require no machinery work, and can be made in about the same time as a sand match.

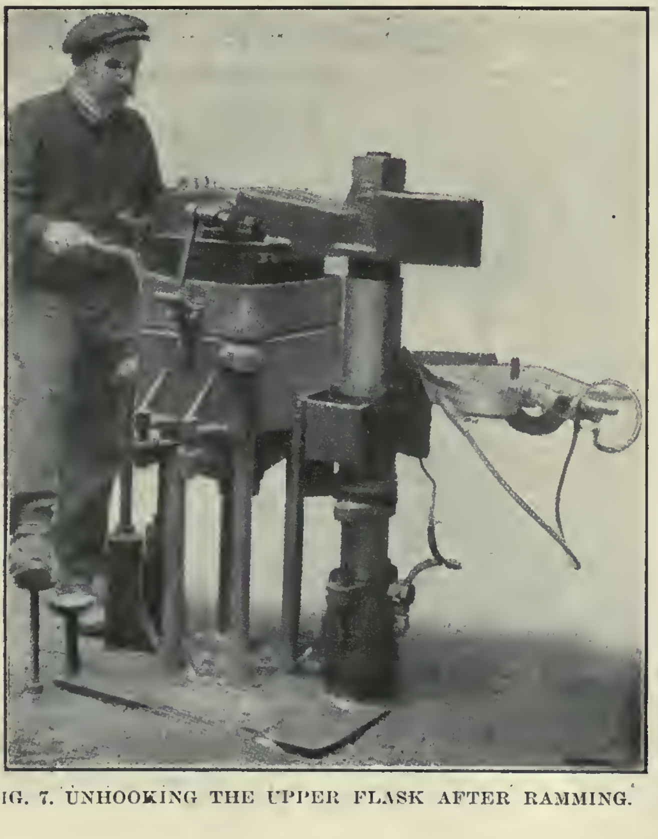


FIG. 7. UNHOOKING THE UPPER FLASK AFTER RAMMING.

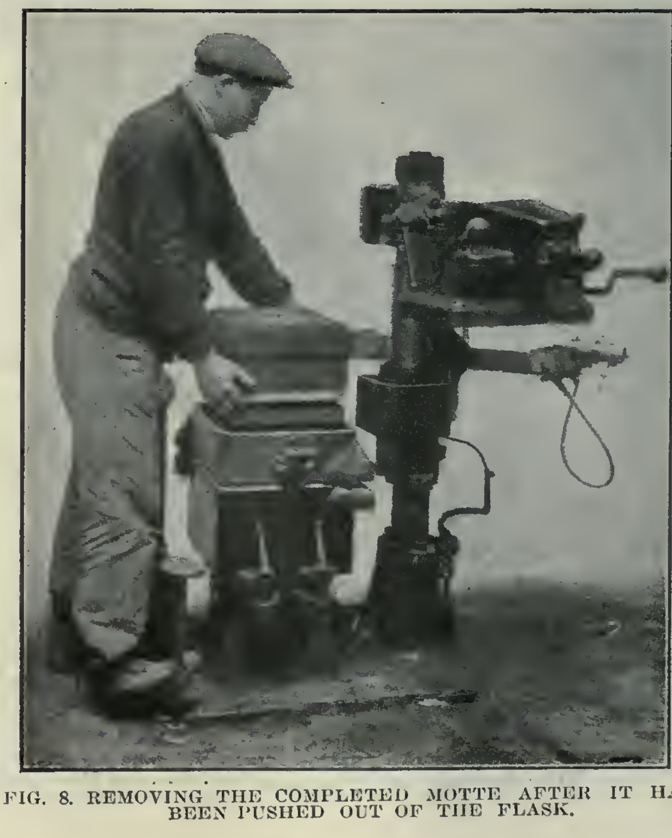


FIG. 8. REMOVING THE COMPLETED MOTTE AFTER IT HAS BEEN PUSHED OUT OF THE FLASK.

The employment of barred flasks with the machine allows comparatively shallow flasks to be used even for large sizes and does away with the necessity for weighting when pouring on the flat, or using a screw-press when pouring on edge, the latter process being rather a delicate one. The use of white-metal pattern-plates is, of course, a feature of Bonvillain and Ronceray's general practice, and they are employed in connection with the moulding-machines for more complicated work which are constructed by the firm. It may be said here that the pattern-plates are produced in a special flask on the machine itself from ordinary wooden patterns. After the impress has been taken in the sand, the two parts of the special flask are spaced apart by a frame which forms the outside of the pattern-plate when the white metal has been run.

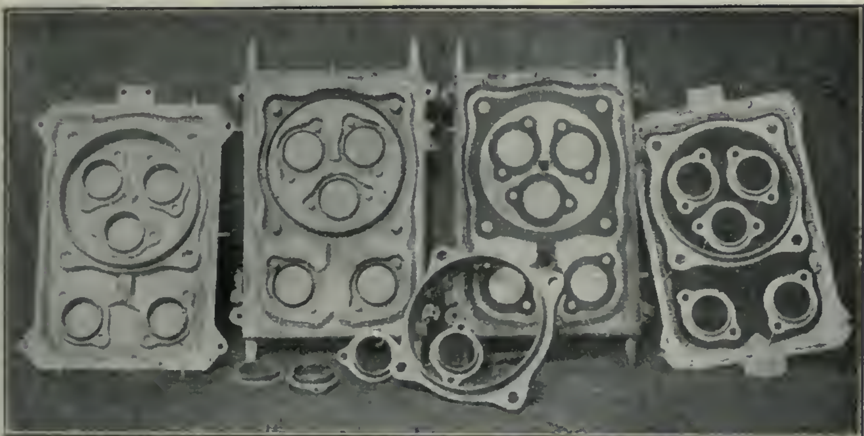


FIG. 9. PATTERN PLATE, MOLD AND DUMMY.

New Machine Features.

The machine illustrated is operated by hydraulic pressure, but has a compressed air attachment for the vibrator. If necessary, the whole machine may be worked by compressed air, and there are several plants of this class in operation. The makers, however, in accordance with their general practice, prefer hydraulic operation when possible. The various parts of the machine may be followed from Fig. 1. The base casting is formed in one part with the ramming cylinder (B), the ram of which is shown at C. Inside the main cylinder (B), a second smaller cylinder carrying a small ram is bolted. The object of the smaller ram is to enable auxiliary motions, such as bringing the flasks in contact and closing the mould, to be carried out quickly. The final ramming is done by the ram cylinder (B), and its ram (C). The smaller auxiliary cylinder and ram are under the floor, and cannot be seen in the figure. In addition to the two rams already mentioned, there is a small ram which is carried on the top end of the main ram (C). This ram is bolted to the plate (D), which carries the down-sand frame (F) by means of the rods (E), (E). This small ram is supported by air-pressure, and its purpose is merely to carry the down-sand frame on a flexible support. At one side of the machine there is a column (H), which supports a bracket (I), arranged to swing in a horizontal plane. This bracket carries the pattern-plate (J). The column (H) also supports the cross-beam (K), which can swing in a horizontal plane, and which can be fixed in position over the machine by the hook (L).

Machine Operation.

The working of the machine may be traced through by considering the cycle of operations to start with the various parts in the positions shown in Fig. 2. It will be seen from this figure that the bracket (I) and the cross-beam (K) are swung outward clear of the down-sand frame (F), and that the drag is in position this frame. The cope is in position on the pattern-plate which is carried by the bracket (I). The condition being as above, the two flasks are filled with sand, one by each of the two men who attend the machine. The cope-man then swings the bracket (I) so that it comes in position over the drag, the drag-man meanwhile swinging the cross-beam (K) and fixing the hook (L) in position. The drag-man then presses down the treadle, which can be seen in the figure, and admits pressure water to the auxiliary cylinder which has already been referred to. The result is that the whole equipment is raised quickly, the pattern-plate being caught in passing by the drag, until the cope comes in contact with the upper ramming-plate. During this motion, the main cylinder (B) will have been put in communication with a supply tank and have been filled with water. By pushing the treadle a little further down, the drag-man now cuts off communication to the tank, and admits pressure water to the main cylinder. This completes the ramming, the position of the parts of the machine during this time being as shown in Fig. 1.

The next step is for the cope-man to start the vibrator, the position of which on the bracket (I), can be clearly seen in Figs. 1 and 4, and for the drag-man to hook the cope to the cross-beam (K) by means of the two hooks which can be seen in all the figures. The drag-man then leaves the treadle, and the ram (C) begins to fall, taking down the drag and pattern-plate with it. The pattern-plate is caught by the bracket (I), and the drag sinks away from it until the drawing is completed, and the machine appears as shown in Fig. 3.

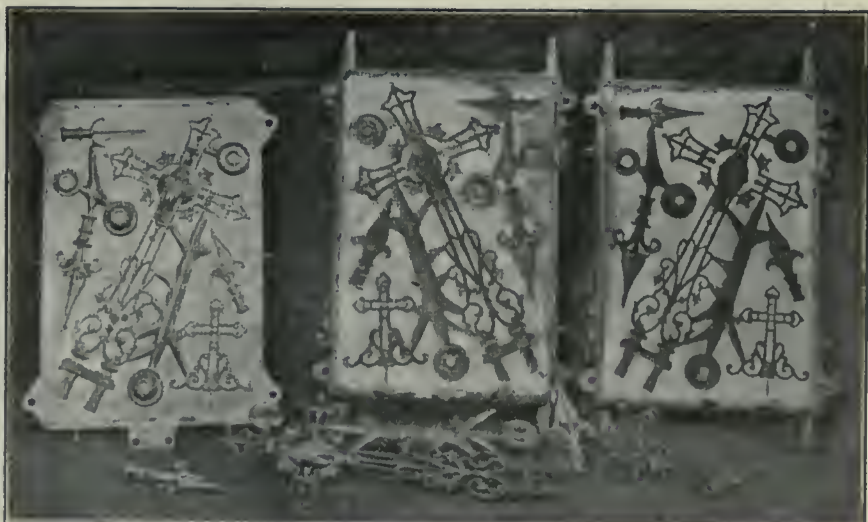


FIG. 10. EXAMPLE OF WORK PRODUCED BY MACHINE.

During the whole of the drawing the vibrator is in operation, but it is now stopped by the cope-man, who then swings out the bracket (I) into the position shown in Fig. 4. The drag-man then presses down the treadle again, admitting pressure water to the auxiliary cylinder. This closes the mould. The drag-man next unhooks the cope and leaves the treadle, and the completed mould sinks down, and is ready for lifting to the floor. The flasks before lifting are secured together by the small hooks which are fitted to them and which can be seen in Figs. 1 and 2.

The working of the machine is very rapid, and on an average it takes less than a minute to make a complete mould. A series of cinematograph pictures have been taken of the machine in practical work, during which the average time was 45 seconds. These cinematograph pictures have been analyzed, and the following table for the various motions compiled from them. At the time of the trials, the machine was using barred flasks 21½in. by 14½ in. by 2¾ in.:—

Moulder.	Seconds
Pick up drag and put it in place....	1.9
Fill up drag (two shovelsful), and put sand in riddle	6.4
Riddle sand on drag top	9.0
Strike off surplus sand	4.5
Swing on the pressing-head and lock it	1.8
Squeeze and hook cope	5.5
Draw pattern-plate and finish gate-holes with fingers	7.7
Apply pressure to close mould and unhook cope	1.9
Release pressure, spring out pressing head, and lock finished mould.....	1.8
Place mould on floor (on end).......	4.5
	45.0

Helper.	Seconds
Blow-off pattern-plate; swing sand-frame above cope, shake parting and riddle sand on pattern	10.4
Fill up cope (two shovelsful)........	6.9
Strike off surplus sand	4.5
Swing on pattern-plate with cope on	7.4
Start vibrator	5.6
Swing out pattern-plate and put cope on	3.9
Lock finished mould	1.8
Place mould on floor (on end).......	4.5
	45.0

Weight of an empty shovel	6	lb.
Weight of sand in shovel	22	lb.
Number of shovels in each part of flask..............	2	
Weight of sand in two parts of flask..............	88	lb.
Weight of two empty parts of flask..............	82½	lb.

It should be noted that no automatic sand-distributor was used with these tests, the men shovelling the sand from a heap.

It should be noted that no automatic sand-distributor was used with these tests, the men shovelling the sand from a heap.

Machine for Moulding Shallow Woril.

It is, of course, clear from the foregoing description that the machine operates on a system which involves printing the drag. It may be thought that this will restrict its use to very flat work, but by means of what the makers call a dummy, the difficulty of printing deeper articles has been overcome to a great extent. The dummy is a metal form, made by moulding, which has holes corresponding to the projections of the mould to be made. An example of a dummy is shown at the right-hand side of Fig. 9.

The dummy in use is placed on the drag side, and sand is riddled on to it, projections of sand obviously being left in places corresponding to the openings in the dummy. In addition to the dummy, Fig. 9 shows the pattern-plate, the moulds, and the articles which are being produced. Further examples of the class of work for which the machine is specially suitable are given in Fig. 10.

Machine for Casting Mottoes.

A further machine of the same class as that just described, but adapted for casting in mottes, has recently been introduced by Bonvillain and Ronceray. It is shown in Figs. 5 to 8. The machine need not be described in detail, as its general features, as will be seen, follow closely those in the previous example. It, however, has an additional feature in the provision of a further lifting-ram in the base-plate, which is adapted for pushing the motte out of the flasks. This ram is operated by the treadle, which the man is depressing in Fig. 8.

In order that the motte may be pushed out in this way, it is clear that the upper flask must be held down. This is done by means of the catches locking it to the lower flask, which can be seen in all the figures. For holding the upper flask up, while the pattern-plate is being withdrawn, there are catches mounted on the upper cross-bar similar to those in the other machine. The remaining feature of the machine will be seen from an inspection of Figs. 5 to 8, the various stages in the operation which these figures illustrate being stated below them.

This latter machine was shown at the Foundry Trades' Exhibition at the Agricultural Hall by the Universal System of Machine-Moulding and Machinery Company, Limited, of 97 Queen Queen Victoria Street, E.C.

MARITIME NAIL CO.

A Fort William report says that the Maritime Nail Co., Ltd., of St. John, N.B., will commence the construction of its new plant at Fort William within a short time. Plans for the buildings are being prepared by a Boston firm. The president and general manager, Mr. L. E. Elkins, is expected back from Great Britain shortly.

PAINT ON CAR EXTERIORS.

AT a recent meeting of shop superintendents in the United States, a novel point was brought up in connection with the unequal service of paint on opposite sides of car exteriors. It appears that a certain electric railway observed that the paint on one side of its cars was deteriorating much faster than the paint on the other side. This seemed inexplicable until it was suggested that as the cars were operated east and west without looping, the difference might be due to the fact that one side of the car was always exposed to the south and the other to the north. Arrangements were thereupon made to overcome this inequality in future by turning the cars occasionally.

LA FRANCE GASOLINE-HYDRAULIC TRUCK.

THE accompanying illustration shows a La France gasoline-hydraulic truck equipped with a two-wheel trailer hauling a 15 ton load of lumber in New York City. The day previous to this photograph being taken, the truck was equipped with the same trailer and with a platform, on which occasion no difficulty was experienced in carrying an 18-ton load of cement up a ten per cent. grade from the Hudson River to 79th Street, and in starting and stopping on the hill.

The Hydraulic Truck Sales Co., 1777 Broadway, New York, are sole distributors of the La France Truck.

LA FRANCE GASOLINE HYDRAULIC TRUCK WITH TRAILER CARRYING A 15-TON LOAD OF LUMBER.

Semi-Steel, the Product of Mixtures of Pig Iron and Steel

By M. Riddell

The accompanying article is an abstract from a paper read last month at the British Foundrymen's Convention, and will be found to deal fully with the production of semi-steel as presently practiced by the foundry trade generally.

FOUNDRYMEN have for long been impressed with the limitations of cast iron caused by the nature and quantity of the various elements which are inevitably associated in that product. This impression becomes accentuated by the knowledge that steel, which exhibits such superior mechanical qualities, is really a purified or refined cast iron. Various suggestions for improving the qualities of the metal by introducing other ingredients into its constitution have, from time to time, been proposed.

The method in which we are particularly interested at present is that of casting from mixtures of pig-iron and steel in varying proportions, the product being known by the somewhat euphonious title of "Semi-steel." The choice of name is rather unfortunate, because the casting produced possessses none of the special virtues which we associate with steel. It lacks ductility and can be neither forged nor welded. The utmost that can be claimed for the mixture is that it is a superior form of cast iron.

Semi-Steel Idea Not New.

The notion that castings could be improved in their mechanical properties by mixing wrought iron, which may be considered to be a very mild steel, or steel itself with pig-iron is by no means a new one. So far back as 1846 we find in the records of the Patent Office that a Mr. Sterling took out several patents for a method of toughening cast iron by melting wrought scrap and pig-iron together. He claimed that with 10 per cent. wrought scrap he got an increase of 10 per cent. in the strength of the casting; with 20 per cent, the increased strength was 30 per cent.; and with 30 per cent.: the improvement in the strength was 60 per cent. With regard to practical working of the process, he makes the significant statement that the improvement depended very largely on the nature of the pig-iron, and that some brands proved more suitable than others.

The difficulty of fixing on the suitable brands of iron, along with the inevitable difficulty of melting and casting sound castings from such mixtures, are doubtless responsible for the method not having been commercially pursued. Sterling's idea was that both metals would melt, and come down together in the cupola, thereby producing a homogeneous result.

In the United States the increasing shortage in the supplies of cold blast irons caused the ironfounders there, and especially those who were interested in the manufacture of rolling-mill rolls, pinions, car wheels and such like, to direct their attention to the finding of a substitute. It is also common practice in a great many machinery and jobbing shops, while several of the largest foundries adopt the method entirely for all their castings.

Difficulty at First.

At first much difficulty was experienced in getting homogeneous metal on account of the steel not mixing or entering evenly into combination with the iron. To overcome this, various expedients were adopted, such as Sterling's method of casting pig-iron round the steel, and also that of melting pig-iron and steel scrap together and casting into pigs to be remelted for the final casting, as is sometimes done with ordinary pig-iron mixtures. In American foundries, chemical analysis plays an important part in the regulation of cupola mixtures, and there is no doubt that a large part of their success with semi-steel is due to this fact.

All the metalloids which are found in pig-iron are, in the case of steel, regarded as impurities. As is well-known, the process of steel-making consists in first practically eliminating these impurities, and thereafter adding predetermined quantities of such as are necessary to give the metal the character desired. When dealing with cast iron, we must take the impurities as we find them, and endeavor by suitable mixing to keep them within bounds for the work in hand.

Carbon is the most important of all the metalloids, as the quality and usefulness of the metal for any purpose is primarily determined by the quantity as well as by the form of the carbon present. The proper regulation and control of this element is the most serious problem the semi-steel melter has to solve.

Melting Difficulties.

As is well-known, pure iron is fusible only at very high temperatures. One effect of adding carbon to pure iron is to lower the temperature at which the metal begins to melt. The more carbon that an iron contains, the more readily is it melted. Shortly expressed, it may be said that the melting point is a function of the percentage of carbon present. In the case of cast iron the other constituents, and especially the phosphorous, assist in lowering the point at which melting begins.

Difficult at First.

Most of the steel scrap which is used in semi-steel mixtures consists of low-carbon metal, such as steel rails or boiler plate. When it is considered that the very high temperatures necessary to melt this material are not usually attained in cupola practice, it is easy to see that, at the very outset, the process is confronted with a difficulty. Notwithstanding its infusibility at cupola temperatures, steel scrap is reduced to the molten condition in the cupola, and it is the more necessary that the semi-steel melter should have some theory regarding the influence at work to render steel fusible, if he is to run his practice on scientific lines.

It has been suggested to the writer as a possible solution of the melting difficulty, that the iron and steel act with respect to each other as do the constituents of an alloy, and that the melting temperature is reduced in virtue of the alloy principle when the constituents are brought into contact. Cast iron and steel are only modifications of the same alloy, and they do not form a eutectic. Further, anyone who has seen how the melted pig-iron trickles down through the coke in more or less restricted and defined channels will appreciate that it would take a very large quantity of pig-iron to effectively reduce a comparatively small quantity of steel.

The Carbon Feature.

Under the conditions which prevail in the blast furnace, iron can absorb or dissolve fully 4.00 per cent. of carbon. The actual amount which will be dissolved is simply a question of time and temperature. It is for this reason that cold-blast irons contain less carbon than hot-blast pig-irons. Steel is a cast iron from which this absorbed carbon has been largely removed, and, when we introduce it into the cupola among carburising influences, it will set about to recover from its surroundings some of the carbon of which it has been deprived. The coke, the carbon monoxide gas, and even the pig-iron itself will be called upon to furnish their share of carbon. It is not necessary for the iron to be in the molten condition before it can absorb the carbon. The action begins soon after the metal is at a good red heat. It is this principle which is the basis of the cementation process of steel-making.

What happens in the cupola is, that the steel absorbs carbon until it contains the percentage necessary for the temperature of the cupola at the time. When this point is reached, the steel may be said to be saturated with carbon, and the slightest increase in either the carbon or the temperature will make it liquid. For example, if the temperature of the cupola is 1,300 degrees C., and the steel scrap consists of boiler plate with 0.16 per cent. carbon, this will remain solid and continue to absorb carbon until there is 1 per cent. present, and whatever part of it contains that amount of carbon becomes fusible at that temperature. With a higher temperature, less carbon will be required and with a lower temperature more carbon will be taken up before the metal is fusible. It is questionable if a temperature of even 1,300 deg. C. is reached in general cupola practice.

In pig or cast iron the phosphide eutectic is the last to solidify, and this it does at the comparatively low temperature of about 950 degrees C. While some of the phosphide gets entangled among the crystals which have formed out earlier, it becomes more segregated towards the centre of the pig or casting. When the pig iron is put into the cupola the centre is the first to liquefy, and by the time the outer portions have reached the melting point of cast iron the whole mass is ready to collapse.

By the time the mixture has reached the temperature of the melting zone it may be said that the pig iron has finished melting, whereas the steel scrap is only beginning to dissolve. The outside of the latter is the only part which is meltable, and therefore the more outside with the less inside the steel has, the more nearly will its speed of melting approximate that of the pig iron.

Adding Steel Scrap to the Ladle.

When steel scrap is added in the ladle, the carbon which is necessary for fusion at the temperature of molten iron will be taken from the surrounding cast iron. To demonstrate that this is what actually takes place, and at the same time to gain some insight into the melting phenomena of semi-steel mixtures, it is only necessary to examine a piece of soft iron or steel rod which has been used in the cupola spout. If the rod be broken at a part where it has been in contact with the running iron, the fracture will show the soft grey iron centre surrounded by a narrow band of close-grained high-carbon steel. The rod appears as if it had been chilled or case-hardened, and a trial with a file will confirm this impression. The carbon in this case could come only from the cast iron, and any portion of the rod which had been dissolved off must have contained about 2.00 per cent. of carbon, the amount necessary, according to the diagram, at the temperature of molten cast iron.

Benefits From Steel in the Cupola.

Among the benefits expected from the use of steel in the cupola is that there will be a corresponding reduction in the percentage of total carbon in the casting. Thus, in a 20 per cent. semi-steel mixture, using a 3.50 per cent. total carbon pig iron and a 0.16 steel scrap, there should be, apart from any reactions in the cupola, only 2.83 per cent. of carbon in casting. The results of a number of analyses with various percentage cupola mixtures show that the steel absorbs sufficient carbon to bring its own carbon content up to somewhere about 2.00 per cent. It may be slightly less or more. Instead of 2.83 per cent. carbon, it will be found that the casting contains nearly 3.20 per cent.

There is, therefore, no advantage to be gained by the use of low-carbon steel scrap in the cupola, but rather the reverse. No matter what percentage the steel contains originally, it must attain the percentage to bring it into equilibrium with the temperature of the cupola before it will melt at all. The less carbon it has to begin with, the longer will it take to reach the saturation point. The most important point for the semi-steel melter to consider is the size and section of the scrap. The cupola will look after the carbon. Hot and fast melting with the metal cleared from the cupola as quickly as possible to remove it from the coke is, of course, desirable.

The Silicon Feature.

Another element which calls for consideration in semi-steel mixtures is the silicon. This substance derives its importance from the influence it exercises over the form of the carbon in cast iron. In steels, all the carbon is in the combined form, and silicon is not desired in that metal. If found at all, it is only in traces. In passing through the cupola, there is a slight loss in the silicon of the pig iron. Assuming, for the sake of simplicity, that this loss is compensated for by the silicon in the steel, a mixture with 20 per cent. scrap as before, and a 2.00 silicon pig will give a percentage of 1.60 silicon in the casting. With practically no alteration in the carbon, this reduction in the amount of the silicon will result in a larger percentage of the carbon being in the combined form, and thus tend to make the casting hard and brittle.

Close attention requires to be paid to this reduction, and provision made for the silicon in the casting being brought up to an amount compatible with the work in hand. It is recommended for light castings of a light section, especially if they are to be machined, that the silicon should be nearly 2 per cent. Heavier castings will do with less.

The other constituents of cast iron, with the exception of manganese, demand only a passing reference. The behaviour and influence of sulphur is the same in semi-steel mixtures as in ordinary mixtures of cast iron. There is this advantage from a semi-steel mixture that the percentage of these impurities is thereby reduced.

Hard Spots.

White hard spots and blowholes are not uncommon in semi-steel castings, their presence being due not so much to any fault of the process itself, as to a failure to understand the conditions which govern the process.

The explanation which is generally given to account for the presence of hard spots in semi-steel castings is that these are caused by imperfectly melted steel, implying that the temperature in the cupola was not high enough to melt it thoroughly. In a paper presented at the Conference two years ago, some interesting observations were made on this subject. The writer of the paper stated, inter alia, that when steel scrap, such as punchings, was used, there was a chance of some of the punchings getting to the bottom of the cupola through the coke. Once they got so far, there was not heat enough to melt them away. These incompletely melted punchings, he believed, were the cause of hard spots. Considering the composition of such scrap, it would appear more natural, however, to expect that the spots would be soft instead of being hard, if imperfect melting was the only explanation. As has already been pointed out, it is possible to melt or dissolve steel scrap in the ladle where the temperature is even lower than in the cupola.

Imperfect Mixing.

The true explanation is to be found, not in imperfect melting, but in imperfect mixing after the metal has been melted. It is merely a question of getting the carbon and silicon evenly distributed throughout the mass. A simple illustration showing how a hard spot can be manufactured will probably make this quite clear. We have only to imagine a small piece of a soft iron or steel rod placed in a ladle of good hot iron, and allowed to lie there without being disturbed. As soon as the temperature of the piece gets high enough, it will begin to absorb carbon from the iron. When at the temperature of the liquid cast iron, it will continue to absorb carbon until it contains nearly 2 per cent. It will take up no silicon at all, and consequently, if the metal is allowed to solidify without being disturbed, a spot will be found in the casting with a high percentage of combined carbon. The obvious remedy was to have stirred the metal until the melted spot had been completely diffused in the surrounding iron.

Melting Rules.

The principal rules to be observed in melting semi-steel mixtures may be summarized as follows:—

Work the cupola hot.

Select the scrap according to its section and avoid massive pieces.

Use clean scrap.

Reckon that the steel in the cupola will contain from 1.70 to 2.00 per cent. carbon when melted, and base calculations on these figures.

Estimate and provide for the silicon in the casting according to this basis, keeping in view the section of the casting as in ordinary iron mixtures.

Above all, take care that the metals are thoroughly mixed, and with this end in view, have the metal hot from the cupola.

Experience shows that the shrinkage and contraction in semi-steel castings are greater than in cast iron, the amounts varying with the proportions used. With the lower percentages, the variation is only slight, but it becomes more pronounced as the proportion of steel is increased, and should be provided for by a corresponding increase in the sizes of the heads and risers.

Owing to the reduction of phosphorus, etc., the range of fluidity of semi-steel is shorter than that of cast iron and the metal sets quicker. To meet this, it will be necessary to pour hot, involving attention to the refractoriness of the facing sand, and to provide ample gates and runners so that the metal may get to all parts of the mould in the shortest time possible.

Castings made from semi-steel mixtures show a close-grained structure when examined under the microscope. The graphite is seen to be in small curly flakes, while the pearlite persists in the sorbitic form. It is due to this influence on the structure that the addition of steel scrap does undoubtedly strengthen a weak and open-grained cast-iron.

To demonstrate the effect of adding steel scrap to cast iron a number of test bars were prepared, firstly, from the pig-iron only, and then from a mixture of the same pig-iron with steel scrap.

	Si.	C.C.	Tensile tons.	Transverse 2 in. by 1 in. bars.
West Coast Hematite	2.8	....	9.80	2,700
West Coast Hematite with 25% Steel Scrap	2.2	0.56	12.50	3,360
General Jobbing Mixture	1.87	0.50	11.75	3,425
General Jobbing Mixture with 25% Steel Scrap	1.5	0.70	14.70	4,400
Hard Mixture with 15% Steel Scrap	1.36	0.72	17.15	3,360

CUTTING SPEEDS.

By Francis W. Shaw.

In discussing the question of cutting speeds, one often hears the assertion that a certain steel is capable of a certain—generally high surface velocity, and by many it is presumed that this speed can be maintained on a given material regardless of any other factor.

Variable Speed Feature.

If on a certain diameter, the speeds provided do not allow of the obtainment of this particular speed, then a certain loss in output must inevitably occur; hence the need for a speed drive infinitely variable between the limits of the capacity of the machine, or a drive having so many speed changes that it may closely approximate the infinitely variable type. As support for this kind of assertion, certain cyphers are presented in an endeavor to show the loss accruing from the absence of this "correct" speed.

Says one:—"Assume, that on a certain job, 50 ft. per minute is the best possible surface speed, and the nearest speeds given by the machine are 40 ft. and 60 ft. Then, if 60 ft. be too high, we should be compelled to use the lower speed, 40 ft., with a consequent loss in output of 20 per cent. To this must be added the establishment charges and so on."

This argument, if it were just, would be sufficient to warrant the closing of the steps between speeds to a very close figure, for even 2½ per cent. is well worth saving, and will pay for a considerable increase in outlay in the construction of the machine. Not only so, but a similar argument would apply equally well to the feed motion, for a similar loss would occur by reason of the absence of a feed rate between 1-40 in. per turn and 1-60 in. per turn. Yet, how frequently do makers of lathes who consider 16 or 18 speeds necessary in a headstock apply the argument to the feed motion. One, indeed, frequently notes such combinations as 16 speeds having a percentage of variation of 20 per cent. between adjacent speeds, and 8 feeds having a percentage of variation of 50 per cent. This is, of course, illogical, if the argument respecting multiplicity of speeds is just.

Establishment Charges.

As regards establishment charges, decreased output during cutting time will not affect them greatly, for at least one-third, oftentimes half of the total time on a job is expended in setting the work and tools, and in other incidentals. The writer has had the opportunity of going rather thoroughly into this question at various times. In one shop, in which were located 45 lathes, each in charge of a turner, there were never more than 9 running at one time. In another shop, this time, a modern capstan and turret lathe department, the idle machines averaged about 60 per cent., although nominally all were in use. The fact that four or six automatic turning machines is sufficient to keep a man busy all the time shows that a waste of some 15 to 25 per cent. is certain.

Again, it is unlikely that all the speeds used on a particular job would be so far removed from the "best" speed as 20 per cent; but the argument is not good, as can be readily shown. To every practical turner, it is a well-known fact that speeds and feeds are inseparable; that if he increases the feed he must decrease the speed, and vice-versa, if the feed be decreased, the speed may be increased.

Controlling Factors.

According to Nicolson and Smith, the controlling factors are, when aiming at maximum output, the quality of the steel being cut, the quality of the tool, the time it is desired that the tool shall remain in good order, and the area of the cut. Given all these, then the speed can be readily determined. A certain formula is given which shows that, within small limits, the cutting speed is almost inversely proportional to the area of cut. Hence, if the speed be decreased within reasonable limits, it is only necessary to increase the feed or depth of cut, or both, to secure the same output. Thus, if the work is capable of being done at a cutting speed of 50 ft. per minute when the area of the cut is one-eighth of a square inch, then at 40 ft., the area of cut can be increased 25 per cent., or to five thirty-seconds of a square inch, giving the same output. On account of the reduction of cut area, coincident with the speed increase, the tool will last approximately as long as before.

If this is correct, and there seems to be no reason to doubt it, the experiment which preceded the dicta being extremely thorough, and supported by outside evidence, then the necessity of providing an infinite range of speeds becomes of much less moment; and still of less importance when one takes into consideration "standing" time, and the fact that maximum output is not always the aim, that quality of output may be of more consequence. The writer's own experience dictates that a speed ratio between adjacent speeds is ample for all practical purposes, particularly if a close range of feeds is provided.

Suggested Compromise.

For a small lathe, say, about 14 in. swing, the following is suggested as a good compromise for general work; eight speeds approximately in geometrical progression with a 50 per cent. rise, 30, 45, 67, 100, 150, 225, 340. This would give a cutting speed of 30 ft. per minute on work a foot in circumference, and on work about one inch in circumference. Eight feeds from 1-64 in. to ⅛ in. per turn (preferably also in geometrical progression) would enable almost corresponding outputs to be obtained at several different combinations of speed and feed.

If the machine were installed for work rather smaller or larger than was the intention of the designer, then it would be a simple matter to speed up or speed down by raising or lowering the whole range, that is, by running the countershaft or single pulley faster or slower. To accommodate temporary requirements of this nature, the change also would be temporary. A good plan, and one frequently followed, is to fix two pulleys on the lineshaft and keep a spare belt.—Page's Weekly.

MECHANICAL STOKING OF LOCOMOTIVES.

THE mechanical stoker has been experimentally applied to a considerable number of American locomotives, their huge dimensions rendering such assistance almost essential in view of the large fuel consumption entailed to keep them going; but so far the human fireman still holds his own.

There is, however, an alternative method which is finding considerable favor. This consists of a coal passer, a mechanical device placed in the coal space of a locomotive tender for the purpose of moving the coal forward from the back end of the coal pit, and keeping it within convenient reach of the fireman. The coal passer automatically mixes the slack, which has through vibration settled to the bottom at the back end of the coal pit, with the lump coal which remains on top, thereby supplying the fireman with a uniform grade of fuel during the entire trip.

The mechanical coal passer is of very simple construction, and includes a tilting hopper, with a supplementary hopper connected to the bottom of the coal pit by means of strong cast steel hinges. A rod is connected to the supplementary hopper, and operated by a steam cylinder whereby the hopper is raised to carry the coal forward, at the same time causing the large and small coal to be thoroughly mixed as it is deposited in a position handy for the fireman.

THE SERIES MOTOR.

THE series motor is employed in automobile work almost exclusively, its high starting torque constituting a practical advantage that so far has offset the defects of momentarily heavy copper losses, and consequently reduced efficiency during acceleration periods. Experiments have been made with compound-wound motors, and with regenerative making systems, but there seems little likelihood of such systms finding favor with the lighter types of vehicle, although for heavier work the possibilities are more hopeful.

NEW WELLAND CANAL CONTRACT.

THE contract for the first section of the new Welland Canal was let by the Government on July 18 to the Dominion Dredging Co. at three and a half million dollars, being the lowest tender. This is for section 1 of the new canal, beginning at Lake Ontario. It is the intention of the Government to let the contracts for the work section by section. The new canal is to be finished in five years, and will cost approximately fifty million dollars. Work on section 1 will be commenced at once by the successful tenderers. Keen competition was shown by the dredging firms of Canada in bidding for this contract, and the bid of the successful tenderers is under the original estimate. There were ten tenderers in all, which meant two million dollars in deposits with the Government.

Departmental engineers are concluding the work of checking up on sections 2 and 3. Section 3 is to be the big contract of the canal, and much heavier deposits will be required. The whole work will be under contract this year.

CASTINGS TO RESIST CORROSION.

SOME practical rules laid down by the American Foundrymen's Association for obtaining castings resistant to corrosion are as follows:—

(A)—Use white iron if possible—white irons are especially useful where any acidity is to be encountered.

(B)—If not practicable to use white iron castings, chill those surfaces which are to be in contact with corrosive conditions.

(C)—If grey iron must be used, get dense close-grained castings through the use of steel scrap or otherwise.

(D)—Avoid oxidised metal; use pig irons of good quality, together with good cupola practice. If possible, use deoxidising agents; for example, titanium or vanadium.

(E)—Keep the sulphur as low as possible.

LETHBRIDGE GOING IN FOR MORE INDUSTRIES.

FOLLOWING out the suggestion made by Joseph P. Tracey, Commissioner of Commerce and Manufacture, on his first trip to Lethbridge, the announcement has been made of the formation of a Company to be known as the Lethbridge Industrials, Limited, composed of local businessmen and others for the express purpose of creating a steppingstone which should result in the location here of small industries. The company will be capitalized at $25,000. W. C. Ives, president of the Board of Trade, is one of the prime movers of the new concern, which is patterned somewhat after the lines of a larger Company of business men in Saskatoon.

DOMINION STEEL CORPORATION.

IT IS reported from Sydney that the orders at present on the books of the Dominion Steel Corporation will take the entire output of the Steel Rail Department from now till the first of November. This is considered particularly satisfactory, inasmuch as the Steel Rail Department works night and day. It is expected that, within the next few weeks, orders will be closed which will result in it running to full capacity for the whole of the present year.

MACHINE SHOP METHODS AND DEVICES

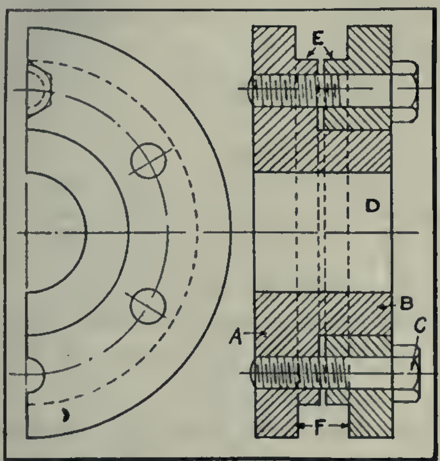
Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

BUSHING FOR TURNING PIECES WITH LARGE BORE.

By E. W. Tate.

THE line cut illustrates a bushing used for turning the face of large pieces, such as ring gears, and may also be used for cutting the teeth on same.

The bushing is made in two parts—a male and female member (A) and (B). The diameters (E) should be turned to



BUSHING FOR TURNING PIECES WITH LARGE BORE.

a good fit for the piece to be face turned or cut, the bore and sides of which have been previously finished while held in a chuck. Care should be taken that the bore of the bushing (D) be of correct diameter to accommodate some standard arbor of the gear cutter. It will also be noted that the distance (F) shall be at least one-sixteenth less than the face of the piece machined.

PREVENTING THEFT OF PERIODICALS.

By J. G. S.

MANY firms provide for their employees, reading rooms well stocked with current popular and technical magazines; books and catalogs. In these, employees spend their noon hour. At a certain factory in Philadelphia the reference books, magazines, etc., in the library represented quite a large sized investment, and although there was a rigid rule in force prohibiting taking the books and magazines away from the library room, a good many used to disappear each month. Simply stamping the firms name on them did not stop this, so it was suggested that all books, etc., in the library be stamped in large prominent letters as follows:—

STOLEN
From the Blank Manufacturing Company

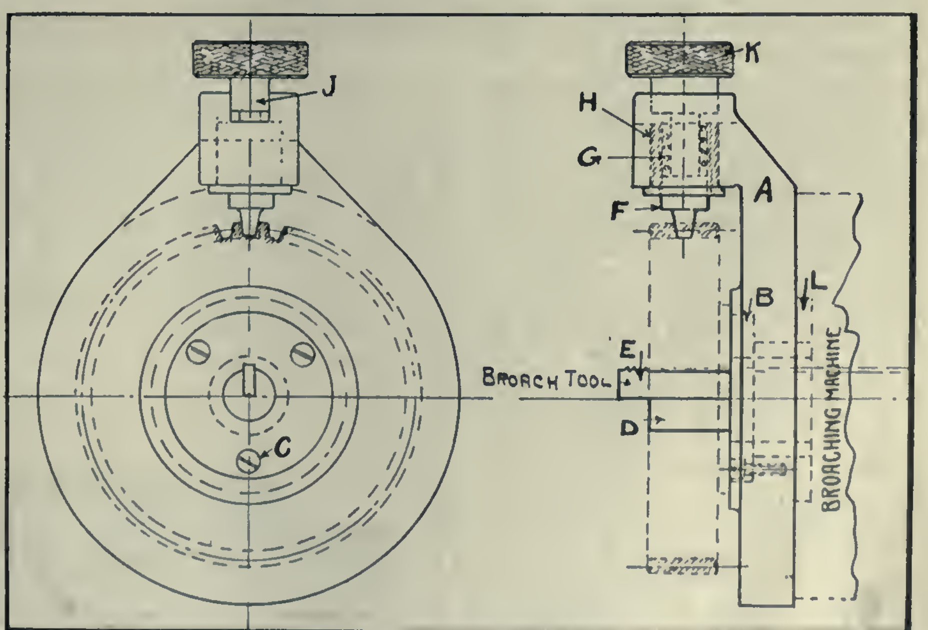
Although the foregoing may seem a little startling, it worked very effectively, and put a complete stop to the practice, as no one cared to carry away a magazine with such marking on it. The plan has also been adopted by different clubs, etc., with satisfactory results.

BROACHING FIXTURE.

By H. R.

THE fixture here illustrated is for the broaching of the keyways in toothed wheels. By this method it is much quicker and more economical than the old slotting arrangement. The main body of the fixture is the casting (A), out of which is turned the spigot (L) for location on the broaching machine. The plug-holder (B) is of hardened steel, being let into the casting and held securely by the fllister head screws (C). This holder is made so as to accommodate any desired diameter of plugs (D), so as to suit the different bores of the wheels to be operated upon. These plugs (D) also form a guide for the broaching tool (E).

The wheel to be operated upon is located for its correct position by the plunger (F). This plunger is pressed into position by the spring (G), and slides in the hardened steel bush (H). The knurled knob (K), as will be clearly noted, slides into a squared off slot (J), so that by lifting the plunger and twisting same round this is held out of the way of the wheel while the next is being put in position. The illustration shows that the wheel is positioned by a space, but sometimes it is necessary to have the wheel located by the centre of a tooth; therefore, a plug is made to suit the form of a tooth.



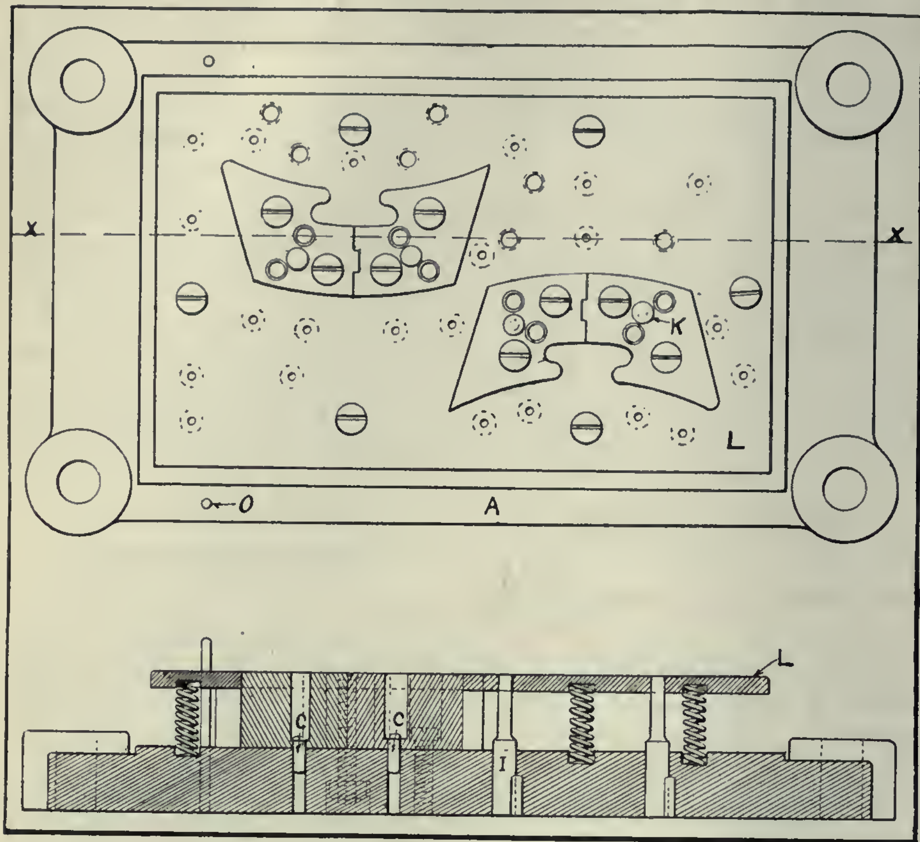
A BROACHING FIXTURE.

BLANKING PUNCH AND DIE.

By A. L. M.

THIS double-sectional blanking punch and die is not altogether original with me, but various improvements I have added from experience. It has proven satisfactory, and I am sure its value will be readily seen. These tools were designed, after some little study, in combination with others in use for the last year and a half, and, although we have not departed from the original to any extent, we have since added improved features to the different sets in service.

Differences of opinion have been discussed as to how these tools should be built up, and the first to be considered was what type of press was to be used. It was finally decided to use the inclined type, with the knock-out arrangements. The reason for this decision was that all the vertical presses were in use, and could not be spared for some time to come.



BLANKING PUNCH AND DIE—PUNCH PLAN AND SECTION X.X.

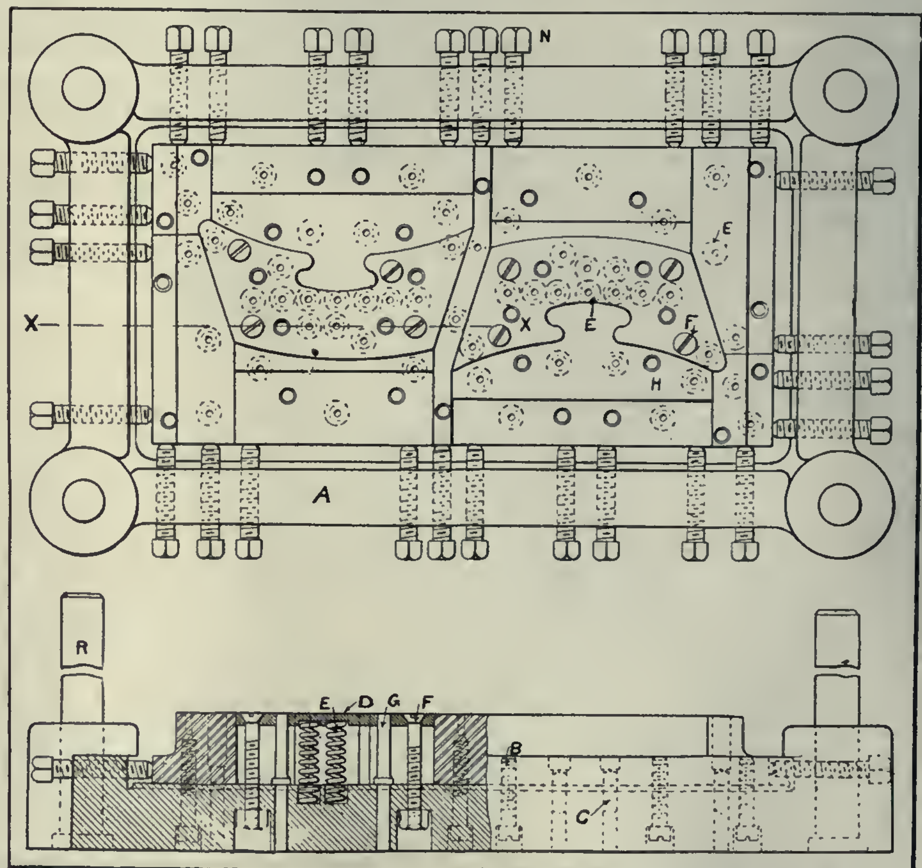
A vertical press could have been used and the blanking dropped through the die. In that case, the die must also be hardened, as there is considerable wear caused by the friction of the innumerable punchings required per day. As an enormous quantity was required every day for over six months, we came to the conclusion that an inclined press with knock-out punch and die arrangement would be the cheapest in the long run. This latter method causes the blanking to fall by gravity after being punched.

The construction and shape of this punch and die are such as to allow it to be machined all over and with the minimum of handwork and filing. It is a very easy matter to lay out a single or solid die, but when it comes to lay out a die for cutting two or more blanks at the same stroke, one finds it a harder proposition unless the design is of a superior quality to sustain an output of 30,000 laminated pale pieces of sheet copper, 0.012 inch in thickness, per day.

Should this double blanking have been made solid, and should small crack have appeared in the hardening it would have spoiled the entire die. In this sectional way all the cutting edges and sides can be ground to templet, and, with very little expense, replacement can be made at once, as duplicate parts of the punch and die were made in case of a breakdown. All the sectional parts are fitted in the cast iron holder (A) with two to four screws (B) and two dowel pins (C). Inside of the die is fitted knock-out plate (D), which has a 1/8 in. movement up and down. Underneath this knock-out plate are placed 12 spiral springs (E), which have a seat in the bottom of cast iron holder and also underneath the plate. The plate is held and adjusted to position with four flat head screws (F).

It is very essential to accurately locate the holes for the punches (G) and bushing (H), as they are fitted and located from the templet, and in alignment to one another, so that they will not stick during operation. The sectional parts of the punch were all machined square and to shape all over, allowing 100th of an inch for finish after being hardened. Those of the die were left soft.

In laying out the holes for the punches and bushings, where approximately marked, one of the holes was drilled and reamed in an adjustable jig vise. By clamping a parallel piece on one end to act as a stop for locating the following piece, the vise was then loosened, and the work removed and cleaned of all dirt, chips, oil, etc. By using different size blocks made for the purpose, the work was again replaced in the jig vise with size blocks between



BLANKING PUNCH AND DIE—DIE PLAN AND SECTION X.X.

the stationary jaw and the parallel stop, and the next hole drilled and reamed. This operation was repeated, a size block added each time to the required dimensions until all the holes were drilled and reamed. With this arrangement, it is possible to space the work far more accurately than it would by the "cut and try" method of using a pair of dividers for laying out the work.

This sectional punch and die was made in the tandem style in order to save as much of the metal as possible without danger of weakening it anywhere. The two cast iron holders (A) slide on four sub-press pins (R) in order to keep the punch and die in perfect alignment during the punching operation. These sub-press pins are made of tool steel hardened and ground to a perfect sliding fit. The head end is left one thousandth large for a drive fit.

The sections are all located permanently on to the holder (A) from the punch after that is hardened and completely finished with the sub-press pins in position. A line is drawn on the outside and around the punch on the die sections, and machined to the line. Each section is marked separately and finished complete, then placed on the die holder to be marked from the bottom for screws and dowel pins. By heating the section to a blue color before scratching the lines, they will then be very visible to work to, as you can see to cut the line in half with the aid of a magnifying glass. By using ordinary vitriol for coloring it is no matter how deep you scratch the line, for when you come down within a few thousandths the line is lost.

In front of the punch are located the piercing pins (I). These are a drive fit in the cast iron holder, and are held securely with a straight pin (J) on one side. On top of each sectional punch is driven in the pilot pins (K). These locate the metal properly when the punch descends.

Around on the outside of the section punches is closely fitted a 5-16 inch stripper plate (L). This is made of machinery steel and is held in position with twenty-four spiral springs, also adjusted to height with six flat head screws with nuts. All the spring holes in the stripper are transferred to the cast iron holder through the 1-16 inch hole in the centre of the spring seats, and after being counterbored for the seat of the spiral spring, they come in perfect alignment.

All die sections when possible are relieved so as to reduce the grinding on the face. When the die is assembled, it is held together with two set screws (N) on each section. In this way the die is as secure as if solid. The punch is located on the press table, and is held with four straps, one on each side. Two guide pins are placed on the left hand and on the end of the punch, and are so located that they are within 1-16th inch from the cutting edge. A punch and die made in this way is very durable, and from a practical standpoint, if any parts get broken, it is quite unnecessary to discard the entire die.

SPINDLE BORING TOOL HOLDER.

By A. L. Monrad.

A DRILL jig is very seldom bored in an engine lathe now, especially where a number of holes are required, and when these are at different angles, because of the importance of securing the proper location and accurate boring of holes for bushing studs, etc. A boring or universal milling machine is the most suitable tool for this purpose, it being used without the left hand support, common to boring bars.

In setting up the work, all measurements are taken from the table or from an angle iron permanently mounted on the rear part of the machine. Ordinary micrometer height-gauges are used in placing a jig in proper position on the table of a boring machine and parallel with the angle iron or the table, assuming, of course, that the angle iron is parallel or of the proper angle required with the spindle of the boring machine.

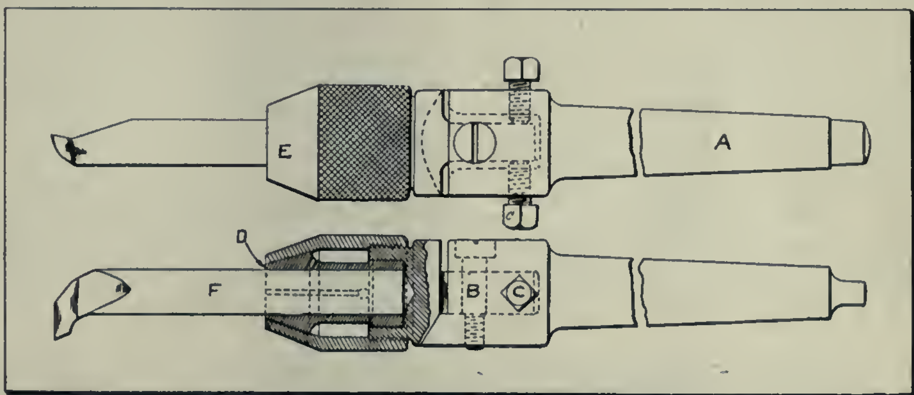
To bore a hole in proper location of the spindle, measure vertically from the table either to the spindle itself or to a short plug arbor made with a half centre on the end for measurement setting. Of course, the spindle must run absolutely true and without shake or play. After locating the spindle for the vertical dimensions, the horizontal measurements are taken from the angle iron to the plug arbor. With the spindle properly located for boring the particular hole, the same procedure is adopted for the next hole.

If two holes are in one line and at the opposite side of the jig, they should not be bored in one setting, as is commonly done, but rather the jig with the angle iron should be reversed on the table of the machine and relocated for the other side. This is recognized as the best practice, and overcomes the long boring bars and support on the opposite side, the latter of which is always more or less in the way. The operator can run his machine with his right hand and at the same time watch the work while cutting. With this method an adjustable boring tool holder is used, as illustrated.

The shank (A) fits the spindle of the machine, the same as an ordinary milling arbor, and the head end of shank is slotted to a sliding fit for the swiveled chuck. This is held in the centre with a shoulder screw (B) and adjusted with the two set screws (C). The other end of this swivel is recessed a turning fit for the split chuck (D). The outside of the chuck is fitted with an ordinary knurled sleeve (E), which is threaded on the end, and with an ordinary grip tightens the boring tool securely.

Making the Boring Tool.

In making a boring tool (F), there is a kink worth knowing. Take the size steel bar required, and drill hole through a scrap of steel of same diameter. Round the corners a little in this hole, and heat the steel in a fireplace to almost white color. Take the steel out and place the boring tool end in the hot hole to the required length to be bent. Hold it there until the steel becomes blue. With the same setting, bend the end over to the right angle. By this method you have a straight boring tool after being filed on the end to proper shape.



SPINDLE BORING TOOL HOLDER.

Electricity has been treating steam with the haughty air of a superior, but is to be compelled again to associate on equal terms with its despised rival. The steam reserve has come to stay.

DEVELOPMENTS IN MACHINERY

A Record of New and Improved Machinery Tending Towards Higher Quality and Economical Production in the Machine Shop, Blacksmith Shop or Planing Mill.

CINCINNATI ACME UNIVERSAL TURRET LATHE.

UNIVERSAL turret lathes are especially adapted for general jobbing and repair work, and where only a small number of pieces are to be made. Their value is more appreciated where a small number of pieces are to be tapped or threaded, which would not justify the cost of taps or dies. For machining a large quantity of parts, the regular turret lathe will be more serviceable.

These machines are designed throughout for the use of high speed steel; all bearings are accurately ground and hand scraped, and the operating levers are placed within easy reach of operator.

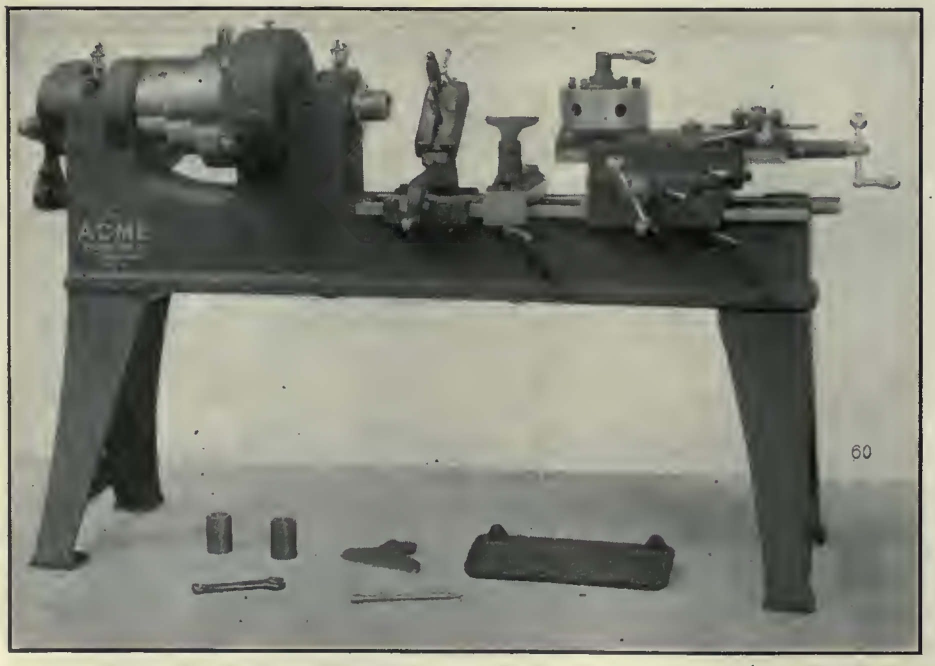
The head is cast solid with the bed, insuring greatest rigidity, and is provided with friction back gears, giving two speeds for each cone step, for turning and threading, or turning different diameters on the same piece without stopping the machine. All gears are entirely enclosed.

The spindle is made of high carbon hammered crucible steel, bored from the solid, accurately ground and mounted in renewable bearings of genuine babbitt.

The turret is round in form, and provided with six tool holes fitted with set screws. It is arranged so that stock up to full diameter of hole can pass through turret, allowing short, stiff tools to be used in turning long work. It is indexed automatically by the backward movement of the turret slide. The turret locking bolt is placed at front end of slide and works in hardened and ground taper bushings, let into the solid turret as near outer edge as practicable.

The turret slide is provided with swivel and set-over adjustments. Both lever and screw feed are furnished for the longitudinal movement of the slide which is graduated for swiveling, and provided with an adjustable stop. The set-over movement to turret is obtained by means of a ball crank handle and screw with large micrometer dial to insure exact diameters, and may be used in conjunction with the adjustable stop at rear of cross slide. The stop for determining the centre position of the turret can be shifted, so the turret can pass beyond centre in either direction. Taper gibs on both sides of slide provide means for taking up side wear. The saddle rests on an adjustable taper base, insuring perfect alignment between holes in turret and spindle. A binder handle on the front of saddle affords a quick and positive clamping of the saddle to the bed, and is not in the way of the operator.

The chasing attachment is arranged for chasing straight or taper right and left hand threads with the same leader and follower. The taper attachment is adjustable and graduated.



FRONT VIEW, CINCINNATI ACME 18 IN. FRICTION GEARED HEAD UNIVERSAL TURRET LATHE WITH CHASING ATTACHMENT AND HAND RESTS.

Three leaders and one three prong follower for cutting 11½, 14, and 18 threads, a hand rest saddle with two hand rests of different lengths, and a double friction countershaft with ring oiling boxes form part of the equipment of each machine. The lathes are also adapted for motor driving.

The Acme Machine Tool Co., Cincinnati, Ohio, are builders of the Cincinnati-Acme Universal Turret Lathe.

OBJECTIONS TO HOLIDAY EXAMINATIONS OF BOILERS.

IT is a common practice, says "Vulcan," for steam users to have the thorough examination of their boilers carried out at general public holidays. In many cases it is impossible, under existing conditions, for this practice to be avoided, however undesirable it may be, but, in large numbers of instances, other arrangements could equally well be made, and a boiler be prepared for thorough examination at some time between general holidays.

Firms very often have sufficient plant to allow for at least one boiler to be laid off at any time for cleaning and examination, but, even when this is the case, many people seem to think it necessary to have their boilers examined at a holiday time, without any regard to other people who are not so fortunately situated as themselves, and who have no alternative. Prudent firms provide themselves with spare boilers for the express purpose of having time to properly conduct the periodical cleaning, and of having the annual inspections carried out at a period when there is no reason for hurry, and when repairs, should they be necessary, may be effected without dislocation of their ordinary work. Such prudence is wiser and more far-reaching than appears at first sight.

Hurried Cleaning.

A boiler cleaned in a hurry is often not cleaned at all, and experienced inspectors are well aware that boilers habitually examined during public holidays are noted for the amount of deposit with which they are coated on the water side. Such an accumulation of scale makes satisfactory examination very difficult, if not impossible, since the condition of the boiler can only be judged by the appearance of such portions of the plates as happen to be visible, coupled with the inspector's knowledge of the general conditions under which it works. It is well nigh impossible in such cases to give an unqualified report.

The coal bills for which badly cleaned boilers are responsible often seem to be forgotten; at any rate, little or no effort is made to reduce them, though the saving of fuel in many cases would in a few years pay for the cost of an additional boiler. Boilers stopped only at general holidays likewise suffer from indifferent cleaning of the external flues, and here again there is often an economical loss through impeded draught due to the flues being more or less choked with soot.

Where as a precautionary measure, or as a matter of necessity, the removal of brickwork from the seatings or over the top of a boiler is desirable, it frequently happens that in the hurry at a holiday period such important and often necessary preparation is altogether ignored, or very inefficiently done· This hurry over preparation, or rather the want of it, is often due, not only to the shortness of time available at a holiday, but to eagerness of workpeople to get away, and it is a common experience of inspectors when making examinations at holidays to find no person present on behalf of the firm. In such cases, if the preparation is incomplete, which it generally is, no one is to be found to render it more perfect, and should any repair be required, there is no official to whom its scope can be explained. It too often happens that no preparation is made for the convenience of the inspector; no tools of any kind are provided, in the shape of hammer or chisel, etc., often even the necessary lamp or candle for lighting purposes is missing, while his personal comfort is altogether ignored.

To sum up the whole matter, the examination of boilers at general holidays is never so satisfactory as at other times. Owners of boilers do not get full justice from their cleaners, and for many economical reasons such inspections should, so far as possible, be avoided. From the point of view of the inspectors, the objections are just as strong. A desire to oblige as many clients as possible makes them extremely busy at such periods; lack of preparation makes the boilers more difficult to examine, and this, in turn, introduces an element of doubt in the results obtained, while the personal discomfort and disadvantages under which they have to perform their duties tend to accentuate matters.

C. Ivan Murray, Toronto, has accepted a position as metallurgical engineer with the Pittsburgh Electric Furnace Co., Pittsburgh.

THE PRODUCTION OF MALLEABLE CASTINGS.

By Dr. Richard Moldenke.

THE first portion of this article appeared in our July 17, issue, and formed, as was omitted to be noted then, the subject of an address before the Connecticut Valley Section of the American Chemical Society, Hartford, Conn.

Next we come to the cupola. The cupola casting is used principally for such purposes as pipe-fittings, agricultural work, and those things that require only a little better strength than the gray casting of the same kind, but more malleability. Cupola malleable is a little cheaper than the air furnace or open hearth product. In all malleable melting processes, inasmuch as the iron is very low in silicon and consequently sets very quickly, it loses its life very easily; and especially if it has been oxidized at all, it must be gotten ino the mold fast. Consequently, a gray iron molder must be shown how to pour malleable; a little twist of the wrist throws the iron into the mold; otherwise it may be short poured. In cupola melting, there is always a very low coke ratio. Melting is done in a very high bed; perhaps higher than it ought to be, but it is necessary to get the iron very hot, and as free from oxidization as possible.

The Bessemer process is used in Europe only. They blow their heats to where the silicon is down to the right point, stop the heat, dioxidize and pour. What the castings look like I cannot say, but with their long anneal, in which the metal is decarbonized, they should make serviceable castings.

The air furnace is the furnace principally used for the production of "malleable" in the United States because it lends itself particularly well to this class of castings. The malleable air furnaces are constructed differently than are the air furnaces for gray iron work. For gray iron, they have large cross sections, and are comparatively short. For malleable, very long furnaces are used, a long flame being desired to get the best result. The heat to melt, whether in the air furnace or the open hearth, does not come from the direct action of the flame so much as it does from the radiation of the interior brickwork. The idea in the air furnace and in the open-hearth furnace is to get the brick work lining so hot that the radiation downward upon the charge does the actual melting, and does it fast, so that no matter how much firing you do, if you do not fire to get your brickwork to such intense heat that the radiation melts the charge properly, you get unsatisfactory results.

Ask the malleable iron man what his ratio of coal to iron melted is; if he melts about two to three pounds of iron per pound of coal, he thinks he is doing well. Sometimes, I have seen a pound of coal used for melting every pound of iron, whereas it ought to be about four pounds of iron to the pound of coal when you run three heats in one day and average them all up. The first heat with the colder furnace is a little harder on the coal supply than the others.

I have observed the operation of many malleable plants. The first thing in going over the air furnace equipment is to see how they are kept. Not unusually you will find that you can look through the brickwork into the interior, there being plenty of spaces where cold air is drawn in. If you figure that the radiation of the lining does the work you can see how important it is that every square inch of the interior of the furnace should do its work.

The Firing Feature.

Take the firing. I have seen men throw the coal all over the bed of fire, and then take the slice bar and poke it up, whereas the right way to do is to pile the coal at the door, shut the latter, allow this coal to coke slightly, and then carefully push it over the entire area. Repeat the operation, and repeat periodically, instead of having the fireman use his shovel and bar all the time. He might just as well rest a little between the periods. The firing is something that must be watched very carefully in the air furnace installation. By so doing, a constant flow of gas is obtained from the coal.

While, in boiler practice, we figure on 100 per cent air admitted over the theoretical amount necessary to burn coal, if we get more than 25 per cent. excess free air in the malleable furnace, we begin to get trouble. If that 25 per cent in excess can be allowed uniformly, we then get that magnificent incandescence in the furnace which does the melting properly. If, on the other hand, the firing is done by fits and starts, the melting is unduly prolonged. One cannot be too particular in this respect because a very large proportion of the trouble in the malleable foundry is due to it.

Starting with say 0.95 silicon, in the mixture, if the heat is made sharp and short, this silicon content will be lowered to the 0.65 required for the ordinary run of castings nicely, and it will drop from 0.65 to 0.60 from the beginning to the end of tapping, whereas with a long, slow melting the iron may be 0.65 at the beginning of tapping and down to 0.55 at the end of the heat or a loss of twice the silicon. And when this occurs the iron has begun to oxidize. Another thing: Take a bath of iron in the air furnace which is deep near the bridge, and feathers out to nothing at the stack. If there is any one thing dangerous in the air furnace it is that thin, feather edge at the end; because there all the gases are swept over it, and the heat is transmitted into a very thin body of metal. Consequently, the temperature rises very fast at that spot; and the iron is liable to burn.

I have been preaching for many years that iron oxidizes in every melting process, even if ever so slightly. The worst case I ever came across contained only three-hundredths of one per cent. of oxygen. Such iron is unfit for use, for the simple reason that the freezing point has been raised; the iron sets too quick. It has lost its "life." In ninety-nine cases out of a hundred the troubles found in malleable castings practice may be located right here. If we study the papers on malleable we have seen recently we find a number of statements on the behavior of castings under certain conditions. These seem to me doubtful, as they may be based on metal that was oxidized in the making in the first place and showed characteristics afterwards which they would not have had they been made right. Air furnaces, which are in prevailing use for "malleable," are subject to this danger peculiarly, and hence must be watched so that heats are made in the shortest time possible.

I have made about 225,000 tons of malleable castings myself, and most of them in the Open Hearth furnace. It is to my mind the best melting process except the obsolete crucible and the electric, of which we know little now but will hear more of some day. The Open Hearth furnace melting process is only applicable where there is enough work to keep the furnace running steady. Look at the melting ratios: cupola, one to eight; air furnace, one to four under the best conditions (and the furnaces should always be kept in the best of condition); Open Hearth furnace, one to six is the melting ratio. The air in the Open Hearth furnace instead of going in cold has about 1,000 deg. F. heat. Whereas a good heat of 10 tons in the air furnace may take four hours, we can run the same heat in two and a half hours in the open hearth (from the end of the charging to the beginning of the tapping).

Unfortunately in malleable and in gray iron we are dealing with lower temperatures than in steel making, and hence the addition of ferro-manganese does not accomplish deoxidation. Hence, whereas in steel-making the unavoidable oxidation is thus corrected, in the case of malleable and gray iron this is not possible to a sufficiently satisfactory extent. Hence prevention is what must be looked after and not a cure after the damage through oxidation has been accomplished.

In making malleable you have the following condition. A great big bath of molten iron, hot on top, and down on the bottom not quite so hot. You take your test plugs, the fracture shows crystalline and white; it indicates that the composition is right. When you tap you draw the colder iron from the bottom first. The top of your charge comes down maybe an hour later. In the meantime the oxidizing reaction goes on; slag has been taken off; there is a direct contact with the gases, the metal is damaged. It should really be taken from the top first. The ideal method of getting iron out of an air furnace is to take it from the top. The tilting furnace gives this result. The tilting furnace costs about twice as much as the ordinary open hearth furnace. I therefore patented a three-spout arrangement for my furnaces, thus taking off six or seven tons from the top; then the next six or seven tons below; then break the breast out and get the rest of it from the bottom. This gives the ideal condition of the tilting furnace in sufficient measure.

In my open hearth practice I never skim, but let the slag cover the iron, thus protecting it somewhat against oxidation.

The composition of a malleable casting, so far as the silicon is concerned depends on its thickness entirely. In ordinary work the silicon should be about 0.65. For very heavy work I used to run my silicon down to 0.45. In the old days of charcoal iron my regular silicon was 0.35 (charcoal iron could be used as low in silicon as 0.10). With coke irons it is not wise to have pig iron with less than 0.75 silicon in stock. This brings us back to the question of oxidation again. In making cold blast charcoal iron you have a very small furnace to begin with; charcoal which eagerly absorbs oxygen as a fuel and hence the iron sponge formed melts with the least chance of oxidation. With the hot and more powerful blast, there is little further penetration of free oxygen; with the consequent greater oxidation of the iron sponge as it melts, and hence a weaker iron. With coke fuel there is a very serious entrance of free oxygen. Coke does not unite with the oxygen in burning as fast as in the case with the charcoal. The difference between charcoal and coke irons lies only in this oxidation question. It is the basis of all the trouble we have with our bad castings, because I know that wherever I have changed the method of melting to eliminate chances for oxidation troubles have fallen away.

The Sorting Room.

The next department to study is the sorting room. The castings from the foundry are first run through the hard tumbling room to clean them; then sorted to find the defective ones. If the foreman knows his business, by watching this department he can teach each man to overcome his difficulties and the losses will be cut down in consequence.

In annealing the idea is to get the castings up to the annealing heat quick, hold them at annealing heat for a given time—sixty hours is best—then to let them cool gradually. The quicker you can get the heat up in your ovens the more time you can save. You can keep them in the annealing ovens sixty, seventy, eighty, ninety hours; but sixty is found to be about right; and the specifications usually call for that as a minimum. The process is best carried out by packing the castings in oxide of iron. The material that we use is puddle scale, a silicate and oxide of iron. The material best and cheapest to use was the flakes from the pots. They are almost pure iron oxide. There are other methods used on occasion. In some of our railroad work, tie plates for instance, these castings can be put loose in the oven, practically making a retort of this and use no packing whatever. But the castings look rough when they came out but are good enough for the purpose.

Annealing.

As to temperature of the anneal—the old-fashioned way of looking at the cracks in the brick work to see the white line is very good if the eye of a man does not change. I prefer the Le-Chatelier pyrometer. The temperature should be taken at the coldest point of the coldest pot in the oven and not the temperature of the oven itself.

The temperature at the coldest point of the coldest pot should be 1350 deg., F.; it may go as low as 1250 or it may be as high as 1400. For cupola iron, the temperature must be about 200 degrees higher, because of the fact that the iron was melted in contact with the fuel, and has a higher sulphur content, which obstructs the annealing changes at lower temperatures.

There is much more that could be said on this subject. It is a life work to become familiar with all the peculiarities of this single line of the iron casting industry. Enough, however, has been given to show what an interesting field the production of the Malleable Casting is, and how much there is still to be learned in this direction.

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PRINCIPAL CONTENTS.

EFFICIENCY AND EQUIPMENT.

AT the present day, perhaps more than ever before in the history of industry, the question of costs is a matter of vital importance. New methods for their accurate determination are being applied and by means of a series of careful assays and observations, a set standard of efficiency of production can be arrived at for each of the various factors that go to make up the cost of any commodity. Of these factors, by no means the least important are the indirect charges for maintenance of power equipment.

Mr. Harrington Emerson, one of the few authorities on the subject of efficiency, urging the importance of giving detailed attention to the question, says that "no one acquainted with the scandalous inefficiency of the average factory power plant, consuming from 5 to 7 pounds of coal per H.P. per hour will question the ability to lower costs 28 per cent., and no one acquainted with the leaks of air, steam and water, leaks of light and heat, frictional losses due to lack of alignment, too tight bolts, etc., will question the possibility of reducing the power consumption 30 to 33 per cent." The day is not yet in sight, however, when in every power plant where an engineer is employed, standards of efficiency can be set as definite as the dollar, franc, sovereign or mark. Even in large installations where the expense would be justified, there are as yet but few staff experts appointed for this work alone.

Although the value and importance of efficiency is not yet generally appreciated, the cry is in the air, and already, in even the most unlikely places, the question is being approached, awkwardly and blunderingly it is true, but in the right direction. It will be seen, therefore, that it is becoming increasingly important for those who are engaged in the supervision of our factories, for engineers, machinists and operators generally, to give to the question of efficiency more and more attention, because in the near future those only will fill the best positions who are able to compass a certain established minimum set standard of efficiency.

We make for the highest efficiency, if we assume, until the contrary is conclusively proved, that existing equipment utilized to the utmost advantage is sufficient for all requirements. This is not only common sense, but as a truth, is clearly emphasized in a multitude of ways by every reliable writer on the subject, yet it is an extraordinary outcome of the efficiency movement, a symptom showing conclusively that the real meaning of the word has not been realized that, in many instances, the result of re-organization is friction and complexity instead of smoothness and simplicity, and costly equipment is often added without any real justification of need.

To return to our subject, and confining our observations meantime to those manufacturing plants where power is transmitted by electricity, it may be said even of small installations, that there are almost invariably hundreds of remediable causes that militate against the attainment of a reasonably high standard of efficiency. We are, of course, aware that an installation may be very inefficient with respect to the factors that should determine the choice and type of motors to be used for any particular work, in many instances little or no consideration having been given to the question of torque and speed. Again, controlling devices are often far from perfect, and the methods in vogue for driving may leave room for much improvement in so far as the question of individual or group operation is concerned. Yet the considerations involved in a determination of the best and most efficient course to follow with respect to these questions are so varied in character, that general hints are of little practical use, and while, perhaps, the best advice to follow is that it is better to improve than to replace existing equipment, yet it must not be overlooked that there are often high losses in shafting, which may be eliminated by the substitution of individual motors direct coupled to the machines. On contemplating any such change, it is important to work out whether the saving to be effected will more than balance the interest on the capital expenditure.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

	Per Ton.	
Foundry No. 1 and 2, f.o.b., Midland	$18 50	$18 00
Grey Forge, Pittsburg	....	14 65
Lake Superior, charcoal, Chicago	.....	16 25
	Mont'l.	Tor'to.
Canadian f'dry, No. 1..	$21 00	$20 00
Canadian f'dry, No. 2..	20 50	19 50
Middlesboro, No. 3....	20 75	21 50
Summerlee, No. 2	25 00	26 50
Carron, special	25 00	.....
Carron, soft	25 00	.....
Cleveland, No. 1	21 25	22 00
Clarence, No. 3	20 25	21 00
Jarrow	.....	23 50
Glengarnock	.....	26 00
Radnor, charcoal iron.	30 00	34 50
Ferro Nickel pig iron (Soo)	.....	25 00
Staveley, No. 1	21 75	22 50
„ No. 3	21 25	22 00

BILLETS.

	Per Gross Ton.
Bessemer billets, Pittsburgh ..	$26 50
Open hearth billets, Pittsburgh	26 50
Forging billets, Pittsburgh	34 00
Wire rods, Pittsburgh	29 00

FINISHED IRON AND STEEL.

Per pound to large buyers:

	Cents.
Common bar iron, f.o.b., Toronto..	2.10
Steel bars, f.o.b., Toronto........	2.20
Common bar iron, f.o.b., Montreal.	2.10
Steel bars, f.o.b., Montreal.......	2.20
Bessemer rails, heavy, at mill....	1.25
Iron bars, Pittsburgh	1.55
Steel bars, Pittsburgh, future	1.40
Tank plates, Pittsburgh, future...	1.45
Beams, Pittsburgh, future	1.45
Angles, Pittsburgh, future	1.45
Steel hoops, Pittsburgh	1.60

Toronto Warehouse f.o.b., Toronto.

	Cents.
Steel bars	2.35
Small shapes	2.40

Warehouse import, freight and duty to pay:

	Cents
Steel bars	1.80
Structural shapes	1.85
Plates	1.85

Freight, Pittsburgh to Toronto:

18 cents carload; 21 cents less carload.

BOILER PLATES.

		Mont'l.	Tor'to.
Plates, ¼ to ½-in., 100 lbs.		$2.35	$2.35
Heads, per 100 lbs.........		2.65	2.95
Tank plates, 3-16 in.		2.60	2.60
Tubes, per 100 ft.,	1 inch	9.00	8.50
" "	1¼ in.	9.00	8.50
" "	1½ "	9.00	9.00
" "	1¾ "	9.00	9.00
" "	2 "	8.75	8.75
" "	2½ "	11.50	11.50
" "	3 "	12.00	12.00
" "	3¼ "	13.75	13.75
" "	3½ "	14.50	14.50
" "	4 "	18.00	18.00

BOLTS, NUTS AND SCREWS.

	Per cent.
Stove bolts	80 & 7½
Machine bolts, ⅝ and less	65 & 5
Machine bolts, 7-16.......	57½
Blank bolts	57½
Bolt ends	57½
Machine screws, iron, brass	35 p c.
Nuts, square, all sizes.....	4c per lb off
Nuts, Hexagon, all sizes..	4¼ per lb off
Flat and round head.....	35 per cent.
Fillister head	25 per cent.
Iron rivets	60, 10, -0 off
Wood screws, flathead, bright	85, 10 p c off
Wood screws, flathead, brass	75, 10 p c off
Wood screws, flathead bronze	70, 10 p c off

National-Acme "Milled Products."

Sq. & Hex Head Cap Screws	65 & 10%
Sq. & Hex Head Cay Screws	65 & 10%
Rd. & Fil. Head Cap Screws	45-10-10%
Flat & But. Head Cap Screws	40-10-10%
Finished Nuts up to 1 in. ..	75%
Finished Nuts over 1 in. ..	72%
Semi-Fin. Nuts, up to 1 in...	75%
Semi-Fin. Nuts over 1 in.....	72%
Studs....	65%

Discounts f.o.b., Montreal.

WROUGHT IRON PIPE.

The following are Toronto jobbers' discounts on pipe in effect from April 21, 1913:

	Buttweld		Lapweld	
Standard	Black	Gal.	Black	Gal.
¼ ⅜ in.	62	47	....	....
½ in.	68	58	....	....
¾ to 1½	71½	61½	68½	58½
2 in.	71½	61½	68½	58½
2½ to 4 in. ..	71½	61½	70½	60½
4½ to 6 in.	....	....	71½	61½
7, 8, 10 in.	....	....	66	54

X Strong P. E.

¼, ⅜, ½in. ..	56½	46½	....	....
¾ to 1½ in. ..	67½	57½	....	....
2 to 3 in.	68½	58½	....	....
2½ to 4 in. ..	....	....	65	55
4½ to 6 in. ..	....	....	64	56
7 to 8 in.	....	....	55	45

XX Strong P. E.

½ to 2 in.	43	33	....	....
2½ to 4 in. ..	....	....	43	33

PRICES OF WROUGHT IRON PIPE.

Standard. Nom. Diam.	Price. per ft.	Extra Strong. Sizes Ins.	Price per ft.	D. Ex. Strong. Size Ins.	Price per ft.
⅛in	$ .05½	⅛in	$ .12	½	$ .32
¼in	.06	¼in	.07½	¾	.35
⅜in	.06	⅜in	.07½	1	.37
½in	.08½	½in	.11	1¼	.52½
¾in	.11½	¾in	.15	1½	.65
1 in	.17½	1 in	.22	2	.91
1¼in	.23½	1¼in	.30	2½	1.37
1½in	.27½	1½in	.36½	3	1.86
2 in	.37	2 in	.50½	3½	2.30
2½in	.58½	2½in	.77	4	2.76
3 in	.76½	3 in	1.03	4½	3.26
3½in	.92	3½in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4½in	1.27	4½in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.86	...	.....
7 in	2.38	7 in	3.81	...	.....
8 in	2.50	8 in	4.34	...	.....
8 in	2.88	9 in	4.90	...	.....
9 in	3.45	10 in	5.48	...	.....
10 in	3.20	....	....	...	.....
10 in	3.50	....	....	...	.....
10 in	4.12	....	....	...	.....

IRON PIPE FITTINGS.

Canadian malleable, 40 per cent.; cast iron, 65; standard bushings, 70; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 75; malleable, lipped unions, 65.

COKE AND COAL.

Solvay Foundry Coke	5.95
Connellsville Foundry Coke	5.45
Yough, Steam Lump Coal	3.93
Penn. Steam Lump Coal	3.63
Best Slack	2.95

All net ton f.o.b. Toronto.

OLD MATERIAL.

	Mont'l.	Tor'to.
Copper, light	$10 50	$11 50
Copper, crucible	13 00	14 50
Copper, uncr'bled, heavy	12 00	12 50
Copper wire, uncrc'bled	12 00	12 50
No. 1 machine compos'n	10 50	11 50
No. 1 comps'n turnings	9 50	9 50
No. 1 wrought iron	.....	9 00
Heavy melting steel	.....	8 00
No. 1 machine cast iron	.....	14 00
New brass clippings	8 50	8 50
No. 1 brass turnings	7 25	7 80
Heavy lead	3 25	2 90
Tea lead	2 50	2 50
Scrap zinc	3 25	3 50

Dealers' purchasing prices.

METALS.

	Mont'l.	Tor'to.
Lake copper	17.00	14.75
Electrolytic copper	17.00	14.75
Spelter	6.00	5.50
Lead	5.25	5.10
Tin	43.75	43.00
Antimony	10.00	9.75
Aluminum	21.00	22.00

SMOOTH STEEL WIRE.

No. 6-9 gauge, $2.35 base; No. 10 gauge, 6c extra; No. 11 gauge, 12 extra; No. 12 gauge, 20c extra; No. 13 gauge, 30c extra; No. 14 gauge, 40c extra; No. 15 gauge, 55c extra; No. 16 gauge, 70c extra. Add 60c for coppering and $2 for tinning.

Extra net per 100 lb.—Spring wire; bright soft drawn, 15c; charcoal (extra quality), $1.25.

SHEETS.

	Mont'l.	Tor'to.
Sheets, black, No. 28	$2 85	$3 00
Canada plates, ordinary, 52 sheets	2 80	3 00
Canada plates, all bright	3 70	4 15
Apollo brand, 10¾ oz. (American)	4 30	4 20
Queen's Head, 28 B.W.G.	4 50	....
Fleur-de-Lis, 28 B.W.G.	4 20	....
Gorbal's Best Best, No. 28	4 45	....
Viking Metal, No. 28	4 40	....

NAILS AND SPIKES.

Standard steel wire nails, base	....	$2 40
Cut nails	$2 60	2 65
Miscellaneous wire nails	75 per cent.	
Pressed spikes, ⅝ diam., 100 lbs.	....	2 85

FINE STEEL WIRE.

Discount 25 per cent. List of extras. In 100-lb. lots: No. 17, $5; No. 18, $5.50; No. 19, $6; No. 20, $6.65; No. 21, $7; No. 22, $7.30; No. 23, $7.65; No. 24, $8; No. 25, $9; No. 26, $9.50; No. 27, $10; No. 28, $11; No. 29, $12; No. 30, $13; No. 31, $14; No. 32, $15; No. 33, $16; No. 34, $17. Extras net. Tinned wire, Nos. 17-25, $2; Nos. 26-31, $4; Nos. 30-34, $6. Coppered, 75c; oiling, 10c.

MISCELLANEOUS.

	Cents
Putty, 100 lb drums	$2.70
Red dry lead, 560 lb. casks, per cwt.	6.00
Glue, French medal, per lb	0.10
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.26
Benzine, per gal.	23½
Pure turpentine	0.60
Linseed oil, raw	0.60
Linseed oil, boiled	0.63
Plaster of Paris, per bbl.	2.10
Plumbers' Oakum, per 100 lbs.	3.25
Pure Manila rope	17

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents.

Montreal, July 21, 1913.—Despite the mid-summer dullness talked in most lines, the machine tool and kindred business is reported active and good. Some of the biggest contractors have made concessions, and there has been a loosening up, so that the trade in steel building material has been given an impetus that means a great deal to the tight money situation. The railways have been giving decent orders, and have done their best to relieve stringent markets by ordering sometime in advance. Considerable business is expected for viaducts and bridges in September. For bars, plates and shapes there has been considerable enquiry, in fact the specifications have gone forth in some cases, hence the confidence extant in the market. Small orders were in vogue for steel plates, and steel pipe has been in good demand, while wire products have continued weak, with sagging on black and galvanized sheets. There is anticipated a readjustment of wire prices, which will mean, perhaps a larger business in the fall.

Pig Iron and Copper.

A further downward tendency has taken place in the pig iron market, and all speculators have been compelled to acknowledge that this dip is the nearest approach to the limit in lowness that has been known this year. On the strength of this condition some large orders have been placed by pipe mills and steel plants, but the territory sales have been very small. The general waiting attitude in copper is rampant, and no one is in a mood to move. Why? Simply because the big producing and selling interests have combined to make a bid for higher prices during August and September, i.e., for shipment. Many premature efforts have been reported to advance the market.

Tin and Spelter.

There has been a steady movement in tin which has been gratifying to buyers and sellers, yet the quietness has been very marked. A slight decline has been in evidence, but this does not change the normal quotations which cover the week. Some concessions from the asking price made by dealers has caused some irregularity, but just to-day higher prices were being asked again. No vitality has been behind this movement, hence the quietness. Lead is quiet and easier, and refined spelter is dull and weaker. Old metal is also dull and uninteresting.

Toronto, July 22nd, 1913.—Practically no change is to be noted in the machinery and metal markets, the tendency being still to quietness. There is a fair demand for machine tools, but buyers appear to be holding off orders until the present money stringency passes. Favorable crop reports are expected to help matters to a large extent. Municipalities are curtailing their expenditures until more favorable opportunities arise for placing loans. Iron and steel merchants report a better outlook, although prices remain stationary. The American manufacturers of cast iron pipe fittings have withdrawn their price lists, and it is difficult to say which way the prices will go upon revision. It is probable, however, that they will be increased, as prices have of late been inclined to the low side. Trade in this line continues to be fair. No change has occurred in the local market in the prices of metals, some nice orders having been placed, although there is no heavy demand. Generally speaking, the conditions are quiet in this section also. Reports from London and New York indicate a like tendency.

Lethbridge, Alta.—The city council have purchased the Lethbridge Woolen Co. Mill, and will convert it into a municipal power building. The building will be equipped with power sub-divided and leased to small industries.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Engineering

Preston, Otn.—The Preston Chair Co. will build a factory here.

Montreal, Que.—The Walpole Rubber Co. may build a new factory here.

Peterborough, Ont.—The Can. General Electric Co. are making additions to their plant.

Hamilton, Ont.—The Dominion Steel Castings Co. will probably build an addition to their factory.

Montreal, Que.—The Robt. Mitchell Co. are proposing to build a large iron foundry adjoining their present plant.

Fort William, Ont.—The National Tube Co. have begun the construction of a plant to cost $400,000, and employing 150 men.

Montreal, Que.—The Board of Control have awarded the contract for the supply of two steam boilers to the Wickes Co., Saginaw, Mich.

St. Thomas, Ont.—It is reported that a United States syndicate propose to build a factory here for the manufacture of motor trucks.

Fort William, Ont.—The Great West Wire Fence Co. are under contract with the city to erect a plant for the manufacture of wire, to cost not less than $100,000, and employ 50 men.

St. John, N.B.—The Maritime Nail Co. have leased a mill in Germany, where they will roll their own rods. A contract for billets has been made with the German Steel Corporation.

Peterborough, Ont.—The de Laval Dairy Supply Co. are building a factory and installing equipment which will cost about $200,000. The company's separator factory will be moved from Montreal about September 1st.

Montreal, Que.—The Board of Control have accepted the tender of the Canadian Allis-Chalmers Company for the supply of an electric-driven pump of six million gallons capacity for the high level reservoir, for the sum of $6,356. The Canadian Boving Co. and Escher Wyss Co. also tendered.

Fort William, Ont.—Frank Ditchfield, General Manager of the Canadian Car & Foundry Co., states that the Fort William plant of the Canadian Car & Foundry Co. will be taxed to its capacity in supplying cars to the various Canadian railways just as soon as it is completed, which will probably be in the early fall.

Fort William, Ont.—M. A. Ryan, President of the National Boiler Works, Superior, Wis., has been in the city and has about completed arrangements for a site on which to locate a boiler manufacturing and structural steel industry. The plans and specifications of the proposed establishment have already been issued and no time is to be lost in putting up the buildings.

Electrical

St. Thomas, Ont.—The city council are considering the installation of a reserve steam-driven generating system.

Woodville, Ont.—A by-law has been carried to sanction the expenditure of $4,000 on a Hydro-Electric Power Service.

Calgary, Alta.—A by-law recently submitted to the people to empower the city to raise a loan to establish a municipal power building was defeated.

Edmonton, Alta.—The Sturgeon Power & Coal Co. have submitted a proposition to the city council in which they offer to supply the city with power generated at a point near the Sturgeon River where they have purchased 960 acres of coal lands.

PROBABLE EQUIPMENT REQUIREMENTS

The undernoted firms are now, or likely to be soon in the market for new equipment, etc. For fuller details, reference should be made to the news items:

Machine Tools.

Robt. Mitchell Co., Montreal, P.Q.
National Tube Co., Ft. William.
De Laval Dairy Supply Co., Peterboro.
Can. General Electric Co., Peterboro.
Great West Wire Fence Co., Fort William.

Brick Plants.

Clay Products Co., St. Catharines, Ont.
Face Brick, Ltd., Moose Jaw, Sask.

Woodworking Machinery.

Malone Moulding & Framing Co., Montreal, P.Q.
Preston Chair Co., Preston, Ont.
R. MacLean, Ottawa.

Refrigeration.

Searle & Lawson, Fredericton, N.B.
Crystal Ice Co., Calgary.

Boilers.

Carlyle, Sask.
Prince Rupert, B.C.

Electrical Supplies.

Carlyle, Sask.
Ayr, Ont.
National Tube Co., Fort William, Ont.
Bassano, Alta.
Robert Dodds, Guelph, Ont.

Generators.

Winnipeg, Man.
Bassano, Alta.

Contractor's Supplies.

T. F. Wineland Bldg. and Const. Co., Prince Rupert, B.C.
Thomas Kelly & Sons, Winnipeg.
Waugh, Meisener & Bailey, Vancouver.
E. G. M. Cape, Montreal.

Steam Plants.

Carlyle, Sask.
St. Thomas, Ont.
Walpole Rubber Co., Montreal.

Incinerators.

Windsor, Ont.
Fort William, Ont.

Municipal.

Carlyle, Sask.
Bassano, Alta.
Toronto, Ont.
Bedford, P.Q.
Port Coquitlam, B.C.

Montreal, Quebec.—Duncan MacDonald, president and managing director of the Canadian Autobus Co., has left on a visit to London, Eng., to fix finally upon the type of motor bus for Montreal, and order supplies if the vehicles offered by the London General Omnibus Co. are found to be suitable for this city. That company have not only offered to supply Montreal with the requisite vehicles, delivery at the rate of 25 per week, but they have offered to take up a large block of shares in the Montreal concern, and one of the London directors, Mr. Duff, will have a seat on the Montreal board. If, therefore, the London type of bus is found suitable, Mr. McDonald will order deliveries immediately. 100 buses will probably be put into commission to begin with.

Wood-Working

Medicine Hat, Alta.—D. Rutherford and M. N. Merrian will establish a planing mill here.

Montreal, Que.—The Malone Moulding & Framing Co. will build a factory. Byers & Anglin, general contractors.

Dundas, Ont.—The Cockburn Lumber and Concrete Co. have practically completed equipping their new plant and will begin manufacturing cement blocks shortly.

Building Notes

Brandon, Man.—Fire has destroyed the C.N.R. elevator. The cause of the fire is unknown.

Port Arthur, Ont.—Good progress is being made in the construction of the new Government Elevator, which is to cost $1,250,000.

Edmonton, Alta.—Nicholson & Bain, of Winnipeg, will build a six-storey building to cost $70,000. The contract has been let and work will begin as soon as possible.

Toronto, Ont.—A permit has been issued by the City Architect to Warwick Bros. & Rutter, for the erection of a six-storey reinforced concrete warehouse at 407 King St. West. It will cost $56,000.

Moose Jaw, Sask.—Face Brick, Ltd., are establishing a new plant near here for the manufacture of pressed bricks. Five "Schope" brick machines will be installed and an output of 10,000 bricks per day is anticipated.

Toronto, Ont.—Plans are being prepared in Ottawa for the new examining warehouse on Front Street. The building will have eight storeys, and will be 500 feet long by 90 to 120 feet. It will cost about $1,500,000.

Toronto, Ont.—The Murray Printing Company has purchased a block of land a few feet north of Queen Street, on the west side of Spadina Avenue. The property was sold by John Earls for $42,000. A new building will be erected.

Brandon, Man.—Tenders have been called for the large fire-proof building to be erected in Brandon for Gordon, McKay & Co., Ltd., wholesale drygoods merchants of Toronto, as their headquarters in Western Canada, and the building will be rushed to completion as quickly as possible.

Municipal

London, Ont.—A by-law will be voted on shortly authorizing the council to expend a sum of $22,000 for a breakwater.

Port Coquitlam, B.C.—The town council have decided to purchase an auto fire truck and hose, the cost not to exceed $2,500.

Ayr, Ont.—Hydro-Electric by-laws were carried by large majorities here and in the neighboring villages of Princeton, Bright, Drumbo and Plattsville.

Calgary, Alta.—It is reported, that in order to induce the Western Canada Flour Milling Co. to locate here, the city has offered a rate of $30 per H.P. per year for power developed by gas turbines using natural gas.

London, Ont.—The British American Oil Company has secured a building permit for erection of an $8,000 warehouse on the east side of Adelaide St., between Bathurst and Horton Sts. The place will have one-storey and will be 125 feet by 40 feet.

Bedford, P.Q.—The town council are considering installing a waterworks and sewerage system. The engineer, R. d'L French, of Montreal, has reported favorably on the scheme and a by-law will probably be voted on. Pumping and filtration plants will be required.

Tenders

Fort William, Ont.—Tenders were recently called for the steel and iron work for the proposed incinerator for this city.

Calgary, Alta.—The Western Canada Brass Foundry Co. are erecting a large factory at Inglewood, East Calagry. It is expected the foundry will be working in about four months' time, and will employ from 250 to 300 hands.

Toronto, Ont.—Tenders are being called for the supply of portable sewage pumping engines. Tenders to be in by noon, Tuesday, July 29th.

Windsor, Ont.—Tenders will be received up till the 29th of July, 1913, for the construction of an incinerator. Plans and specifications may be obtained from M. E. Brian, city engineer.

Bassano, Alta.—Tenders will be rereceived by the engineers, John Galt Engineering Co., Calgary, up till 18 o'clock, Friday, 15th August, for the construction of sewage disposal works. Plans and specifications may be obtained from the engineers.

Winnipeg, Man.—Sealed tenders, addressed to the chairman, Board of Control, Winnipeg, will be received at the office of the secretary, up to 11 a.m. on Wednesday, August 6th, 1913, for the manufacture, delivery and erection in the Generating Station at Point du Bois, of two 3-phase 5,000 K.V.A. generators for direct connection to double re-action turbines, and for spare parts for same; also for one additional or extension set. Specifications, etc., may be obtained at the office of the City Light and Power Department, 54 King Street, Winnipeg.

Carlyle, Sask.—Sealed tenders will be received by F. J. Stent, sec.-treas., up till 18 o'clock on Friday, 1st August, 1913, for the following contracts:—(1) Construction of brick power house and concrete reservoir, and laying approximately 800 lineal feet of pipe in trenches, and relative works; (2) supply or air-pumping system; (3) supply of duplex steam pump; (4) supply and erection of two H.R.T. boilers and stacks; (5) supply and erection of compound vertical steam engine; (6) supply and erection of generator, exciter and switchboard; (7) supply of poles, arms, hardware, copper wire, transformers and meters; (8) supply of series Tungsten street lighting apparatus; (9) erection of pole line. Specifications may be obtained from The John Galt Engineering Co., consulting engineers, Winnipeg and Calgary.

Contracts Awarded

Westmount, Que.—The city council have awarded a contract for laying a section of a system of electric lighting conduits to R. T. Smith & Co.

Winnipeg, Man.—Carter, Halls and Aldinger have been awarded the contract for the swine barn at the new Agricultural College, St. Vital, for $12,718.

Winnipeg, Man.—Crane & Ordway have been awarded the contract for the plumbing, heating and ventilation system for the new law courts. The contract price is $119,000.

New Westminster, B.C. — Waugh, Meisner & Bailey, contractors, of Vancouver, have been awarded the contract for building a quay wall at a cost of $102,000. This is in connection with the harbor improvement scheme.

Long Branch, Ont.—The contract for the new military barracks has been let to Michael Sullivan, Kingston, Ont.

Longueuil, Que. — The. Armstrong-Whitworth Co. have let the contract for the first section of their new plant to E G. M. Cape, of Montreal.

Edmonton, Alta.—The contract for the construction of the new filtration plant was awarded recently to the New York Continental Jewel Filtration Co. at a price of $117,000. The work will be started as soon as the contracts have been signed.

Prince Rupert, B. C.—T. F. Wineland building and construction Co., of Vancouver, have been awarded the contract for the construction of the buildings in connection with the dry dock. These will include a power house, boiler house, blacksmith's shop, boilers and travelling cranes, etc.

Winnipeg, Man.—The Provincial Government have awarded the contract for the construction of the new Parliament buildings for Manitoba to Thomas Kelby & Sons. The contract price is $2,-859,750. Lyall Mitchell & Co. were the only other tenderers. The architect is F. W. Simon, of Liverpool, Eng., who has opened an office in Winnipeg.

Marine

Montreal, Que.—It is reported that the harbor commissioners of Montreal propose to increase the length of some of the piers in the harbor, by 250 ft. to furnish accommodation for more steamers.

Vancouver, B.C. — Announcement is made that the new harbor commission of Vancouver is to consist of F. Carter-Cotton (chairman) and James A. Fullerton and Sam McLay.

Railways—Bridges

Ottawa, Ont.—The Pacific Great Eastern Railway has deposited with the Department of Public Works, detailed plans of its proposed railway along the north shore of Burrard Inlet, between the second narrow and Point Atkinson.

Victoria, B.C.—The Esquimault and Nanaimo Railway Co. have nearly completed the construction of machine shops for their new terminals. E. R. Doe is the contractor and the cost when completed will be approximately $100,-000.

Toronto, Ont.—The Canadian Pacific Railway Company are planning to construct another addition to their coach repair department, at their West Toronto shops, located at Keele and West Toronto Streets. Through their engineer, J. Irvine, they have secured a permit from the Architect's Department for the building. It will be one storey in height, and will be constructed of brick with a concrete foundation. John Hayman and Son Company, of London, Ont., have secured the contract for the building, which will cost in the neighborhood of $26,000.

Refrigeration

Fredericton, N.B.—Searle & Lawson, Ltd., will build a refrigeration and cold storage plant.

Calgary, Alta.—The Crystal Ice Co., Ltd., have purchased a site and plans are being prepared by the architect for a new artificial ice plant. A skating rink will be included in the scheme which will cost about $200,000. The project is being financed by local business men.

General Industrial

Brampton, Ont.—Hough Litho Co., of Toronto, will build a factory here.

Brampton, Ont.—T. W. Hewetson Co., Ltd., of Toronto, will build a shoe factory here.

Guelph, Ont.—Robert Dodds is establishing a knitting factory here. Some of the machinery has already arrived.

Mitchell, Ont.—The evaporator belonging to George Joyut at Hensall has been totally destroyed by fire. It will be rebuilt.

Ottawa, Ont.—Mr. R. MacLean, Montreal, has purchased the old Warnock Mill and will convert it into a flooring and roofing factory.

Charlottetown, P.E.I.—A large warehouse belonging to A. Pickard & Co. was recently destroyed by fire. The loss is estimated at $4,000.

St. Catharines, Ont.—The Clay Products Co. have purchased a site here and will build a plant for the manufacture of bricks, tiles, etc.

Sherbrooke, Que.—The town council are negotiating with two syndicates who are considering the establishment of a woolen mill and a brush and broom factory.

Calgary, Alta.—It is reported that Union Stockyards will be established here on the same lines as those at St. Boniface. The stockyards would be controlled by the various railway companies interested.

Calgary, Alta.—The Tregillus Clay Products Co. who have established a large plant near Calgary, will soon begin manufacturing. Machinery costing $100,000 is being installed, and will soon be in operation.

Bradford, Ont.—The ratepayers will vote on August 12th, on a by-law to loan the sum of $20,000 at 5 per cent., for the establishment of a wire screen factory. The factory will employ a large number of hands.

Trade Gossip

The Monarch Motor Co., Ltd., have sold a 3-ton delivery wagon to the Steel and Radiator Co., of Toronto.

Foundrymen Organize.—A meeting of the foundrymen of the Maritime Provinces was held in New Glasgow recently, and an organization perfected, to be known as the Eastern Foundrymen's Association, having for its object the mutual benefit and protection of their general interests.

H. H. Bigert, general manager of the Canadian branch of the International Harvester Company at Hamilton, Ont., recently made the following statement: "The manufacturing department of the plant will close for three weeks. The centennial celebration following, we will close for another week. That will take the slack out of the situation, and we expect to resume operations in the morning of August 18 with a moderate sized staff. There is nothing unusual in our reposing at this time of the year. We close for two weeks every year at this period. At this time about one thousand men will stop work."

New Incorporations

The Premier Mica Co., Ltd., has been incorporated at Ottawa; capital $50,000. Head office in Toronto.

The Canadian Oil Fuel Co., Ltd., has been incorporated at Ottawa; capital $10,000. The head office will be in Toronto.

Plant of the Canadian Malleable Iron Co., Owen Sound, Ont.

Staff Article

Malleable iron castings now enter so largely into mechanical engineering construction, that it is not surprising to find steps being taken to provide increased facilities whereby they may be procured conveniently and promptly. Canadian plants for their manufacture are few in number at present; that here described being the latest to go into operation.

THE recently completed plant of the Canadian Malleable Iron Co., Ltd., at Owen Sound, Ont., consists virtually of two buildings, each 80 ft. by 125 ft. Both are of concrete construction, with concrete pilasters 20 ft. apart, reinforced with steel trusses, thereby eliminating the necessity for posts, and giving clear floor space. The side walls of the foundry building stand 21 ft. from the floor level. The buildings are well lighted and ventilated, being provided with abundant window space, and with a monitor overhead. The side walls in the annealing department are 25 ft. from the foundation, while those in the shipping department, which is a continuation of the latter, are 17 ft. high. The roof is of asbestos cement. A Canadian Pacific Railroad siding runs the full length of the plant, and being located on the Georgian Bay, docks are available for bringing in coal and pig iron, as well as for shipping the product.

Plant Lay-out.

Starting at the eastern end of the moulding shop, and proceeding towards the bay, the process of manufacturing may be observed. A large portion of the moulding shop floor is given over to floor work, while on the left, almost the full length of the building, are places for about sixty bench moulders. In the centre of the building, available for both benches and floors, is the malleable iron melting furnace. Proceeding westward from the furnaces, we come to the core department, situated in the left hand corner, and occupying a considerable area. On the right from the core department is the exit, by which an entrance is had to the annealing department. These two buildings connect here by a tramway, along which will run cars conveying the castings from the moulding shop to the annealing ovens.

On entering the annealing department there are first to be noted the hard mills, which consist of four tumbling barrels. The castings are treated in these, prior to being annealed. Half-way down the building on the left are four annealing ovens, ample space being allowed in front of them for the storage of pots, in which the castings are packed. At the other end of the building are the soft mills, which consist of eight tumbling barrels of two sizes. After leaving these mills, the castings are shipped.

FIG. 3. ANNEALING OVENS.

Furnace Details and Process.

The first operation is to start a fire in the heating chamber, this being allowed to burn for one hour before the blast is put on. After the blast, there is another interval of one hour before the furnace is charged. Above the furnaces will be seen two levers attached to a runway, by means of which two bungs may be lifted from the furnace and moved out of the way. These allow the charge to be inserted. The malleable iron is charged first in the furnace, fol-

FIG. 1. PLANT OF THE CANADIAN MALLEABLE IRON CO., OWEN SOUND, ONT.

lowed by the steel and spruc, the pig iron being put in last; this is piled up until the beginning of the arch is reached. The two bungs are then placed back in position, and the blast started. After a two hours' run with continuous firing, skimming is started, fuel being added all the time.

A little to the left of the tapping hole seen in the illustration there is a partition of fire brick, which rises to a considerable height, causing the fire, which is drawn through the furnace by blast, to rise, so that it is met by a second blast from a series of pipes above. The fire is thus directed downwards beneath the charge and drawn through the full length of the furnace.

Fifteen minutes after skimming a small ladleful of metal is withdrawn through the skim hole, seen in the illustration, Fig. 2, to the right of the tap hole. This metal, after cooling, is broken, and, from the fracture, the operator can tell exactly how much more heat is required. For pouring, 50 and 100 pound ladles are employed and as the furnace can be tapped from either side, and being in the centre of the building, metal can be quickly transported to the various molds. On the roof of the furnaces an extra set of bungs is kept, in case some of the others give out. Every two weeks a new bottom of silica sand is required in the furnaces, while the bungs, which are made of Beech Creek fire brick, and sealed with fire clay, last about a month.

The stack, 82 ft. high and 8 ft. square, is lined with two courses of fire brick for a height of 20 ft. Draft is supplied by a No. 8 blower, made by the Buffalo Forge Co. Montreal, connected to a 20 h.p. Canadian General Electric induction motor. The blower discharge is 17 inches diameter. The charging space measures 9 x 14 ft., holds 20 tons, and is capable of giving two or three heats per day. The bottom consists of 4 ft. of silicia sand, under which are 18 inches of fire brick over a concrete footing.

The whole space east of the furnace is devoted to floor moulding, there being 30 moulding machines, each capable of 160 moulds a day. On the left, looking west, are 60 moulders' benches.

Core Ovens.

In the left hand corner at the end of this building is the core department, measuring, like the pattern room, 40 ft. square. The core ovens which are of the latest design, were made by the Central Iron Works, Quincy, Ill. There are six trays to each oven, measuring 3 x 6 feet. In each oven the depths of the trays are as follows:—Four of 9 inches, one of 11 inches, and one of 15 inches. On the front of each tray there is cast a clock face with brass finger, by means of which the coremaker can indicate when cores were inserted. An overhead trolley system serves the core ovens, which are fired by coke.

To make their cores, the firm are using core sand supplied by the Hepworth Sand and Products Co., Ltd. Hepworth, Ont. Adjacent to the core ovens are several benches for coremakers, and shelves on which the cores are kept, prior to and after being treated in the oven.

Annealing Process.

After cooling, the castings are taken in large trucks along the tramway into the annealing department. On entering, the truck is stopped at a set of automatic counting scales, made by the National Scale Co., Chicopee Falls, Mass. The castings are then taken to the hard mill consisting, as stated before, of four tumbling barrels. Into these the castings are packed, and revolved for several hours, after which they are prepared for the annealing ovens. The hard mills are run by a 10 h.p. Canadian General Electric motor. There are four annealing ovens, as will be seen by reference to Fig. 3. These were designed by the firm, and can be operated individually, or altogether. The accompanying illustration shows the four doors closed, but not fully sealed. The interior is of Beech Creek 9-inch fire brick, a wedge brick being used for the arch. The ovens are fired from the rear, the fire pit extending beneath, a distance of 8 feet, where it is stopped by a fire brick partition 24 inches high. This causes the fire to pass over the walls of the chamber into the oven and over the castings. It is then drawn through flues in the opposite wall under the floor, passing out to a tunnel and to the smoke stack. The latter is 74 ft. high, and is lined with Beech Creek fire brick.

FIG. 2. MELTING FURNACES.

After being treated in the hard mills, the castings are wheeled over to the annealing pots. These have neither top nor bottom, and stand four high on an annealing bottom, which is notched so as to fit a truck, which conveys them into the oven. The castings are packed into these pots with cinders, which keep them intact when the heat has turned them soft.

Each annealing oven measures 16 ft. 2 in. wide, and 23 ft. deep, and has a capacity of 40 tons in 216 pots. The doors are made in two sections of fire brick. They are 9 inches thick, of $4\frac{1}{2}$ x $2\frac{1}{2}$ x 9 inch Louisville fire brick. Each door is provided with two notches at the base, so that it can easily be moved into position by a special truck. In each oven, at the rear, is a peep-hole, by means of which the internal condition can be seen. The practice is to find out through this peep-hole the approximate color which gives the best results, and by noting the temperature recorded by the pyrometer, operate the oven accordingly.

Annealing Takes Three Days.

When castings have been in an oven for three days, the heat is allowed to die off, and the doors opened wide. Three hours are allowed the ovens to cool. Then the pots are dug out and allowed to stand outside for a few hours before being dumped.

The castings after being sorted, are treated in the soft mills. There are eight tumbling barrels in this section, of two sizes, run in parallel sections of four each. These were made by the Central Iron Works, Quincy, Ill., and are thoroughly up-to-date, the chief feature being a renewable sheet metal lining, which prevents the barrel from wearing out. A 20 h.p. Canadian General Electric induction motor drives this section. Each tumbling barrel is connected by sheet iron pipes with a dust arrester, and it might be observed here that the soft mills, previously referred to are also connected with a smaller dust arrester.

Grinding Rosin for Cores.

Quite near to the soft mills is a rosin mill, operated from the same line of shafting. The rosin is used for making cores. The machine consists of a revolving cylindrical sieve of very fine mesh, containing a tank in which is a 10 lb. ball and a dozen metal stars, which, when revolved, break up the rosin into powder. A portion of the tank is on a swivel, and when in a certain position opens and allows the fine rosin to pass out. This was manufactured by the W. W. Sly Mfg. Co., Cleveland, Ohio, and operates at 50 revolutions per minute.

Pattern Shop.

The pattern shop is equipped with a band saw made by the Crescent Machine Co., Leetonia, Ohio; a cross-cutting and ripping saw, with 6-inch pulley, made by the American Saw Mill Machinery Co., Hackettstown, N.J.; an emery wheel and patternmakers' lathe, by the Seneca Falls Mfg. Co., Seneca Falls, N.Y. and a drill press, by Sibley & Ware, South Bend, Ind. Most of this machinery was supplied through the Canadian Fairbanks-Morse Co., Ltd., Toronto.

The Cinder Mill.

Near the annealing ovens is an interesting machine used for recovering iron from slag. It is known as a cinder mill, and is very similar to a tumbling barrel. Inside is a weight, 30 inches long and 8 inches across, having six corners, which smashes the slag into small pieces. A stream of water passes through it as it revolves, and the water carries away the cinders as they are removed from the iron. The latter remains behind at the bottom of the barrel, and when no more cinders issue from the end of the barrel, it is dumped out, and, of course, used again in the furnace. The water, as it issues from the mill, empties into a series of five cement chambers; and after filling the first chamber, passes into the second through a grating, thus preventing any cinders from passing. To reach the third chamber, the water has to pass around the second partition, and to reach the fourth has to pass through another grating, whence it finds its way to a centrifugal pump connected to a 5 h.p. induction motor, which also drives the mill. The same water is used over and over again.

Use City Power.

The power used throughout the building is alternating current supplied by the town of Owen Sound. It comes to the works at a voltage of 2,200, and is stepped down to 550 volts by means of two large oil-cooled transformers situated in a building some distance from the moulding shop. The transformers were supplied by the Canadian General Electric Co. At present there are eight motors in the building, ranging from 5 to 20 h.p.

Inside of a year it is the intention of the firm to make an addition to the moulding shop, equal in size to the present building, which will make a plant in all of 750 feet in length. Another furnace will also be installed.

WORKMEN'S COMPENSATION IN AUSTRALIA.

A SYDNEY despatch says that a contributory workmen's compensation scheme has been introduced into the Victorian Parliament. This provides for joint contributions from the State, employers and workmen to State accident insurance, to be controlled by a Commission which has the power to issue policies to employers. Premiums are as follows:—

For employers, three-sixths; for workpeople, two-sixths, and the State, one-sixth. Payments are to be made at death to persons wholly dependent, of three years' earnings, or $1,000, whichever is the larger. If there are not dependents, then medical and funeral expenses not exceeding $100 are paid; in the case of incapacity a weekly payment of half the average weekly earnings, not exceeding $5 weekly, the total limitation being $2,000. Persons under twenty-one and over sixty are specially provided for.

STEAM TYPE SHOVEL ELECTRICALLY OPERATED.

STEAM shovels are now common enough in countries where labor is costly, but a case has recently occurred where, in addition, fuel is scarce and water power abundant. This is in forming an earthen irrigation dam in Nevada. According to the Journal of the Royal Society of Arts, the shovel used is similar to that of the ordinary Bucyrus type. The power is supplied by electric motors through single-phase mains. The pressure is transformed down from 2300 to 440 volts. The primary side of the transformers on the shovel is connected to the 2300-volt distributary system by 700 ft. of triple conductor, 2300-volt, cable, which is dragged along to suit the locality of the work.

A special hydro-electric power plant was erected, the magnitude of the work to be done justifying this expenditure. The hoisting machinery is geared to a 115 horse-power, 440-volt, three-phase, 60-cycle variable-speed induction motor, having a full load speed of 680 revolutions per minute, the gear ratio from motor to drum being 15 to 1. The propelling of the car is effected by the hoist motor. The swinging and thrust mechanisms are somewhat similar to that of the hoisting machinery.

PRESERVING THE POLISH OF TOOLS.

By J. Crow Taylor.

CONDENSATION of moisture on the surface is what takes the polish off tools and makes iron rust. Preventing it is simply a matter of keeping the surface coated with some varnish, resinous or oil substance. If tools are carefully cleaned every night, and then gone over with an oily rag, they should keep in very good shape; that is, if they are in use every day so that the oily coating has a frequent renewing. A heavier coating for tools that are to be put away for some time, and one that can be cleaned off readily, can be made by melting together 7 parts of tallow and 1 of resin, stirring the same till it cools. Apply in a half liquid state, thinning to the right consistency with either benzine, gasoline or coal oil.

TEMPERATURE OF TURBO-ALTERNATOR APPARATUS.

THE temperatures actually obtainable are liable to be materially higher than the usual methods of measurement will indicate. A rough measure can be obtained by exploring coils or thermocouples, but it is evident that such coils, if placed next to the copper, will not give the correct temperature measurement if the flow of heat is from the iron to the copper, while a coil next to the iron will not give the correct result with the flow from the copper to the iron. The manufacturer, with his guarantee of 40 degrees C. by thermometer, actually builds for possible temperatures of 70 degrees to 90 degrees C. in some parts of the machine, for he expects to find fairly high temperatures in some cases with exploring devices. The usual guarantee of 40 degrees C., therefore, should be considered as only a relative indication of a safe temperature in such apparatus.

W. Chase Thomson has opened an office in the new Birks Building, Montreal, where he will act as consulting engineer, making a specialty of bridges and other steel structures.

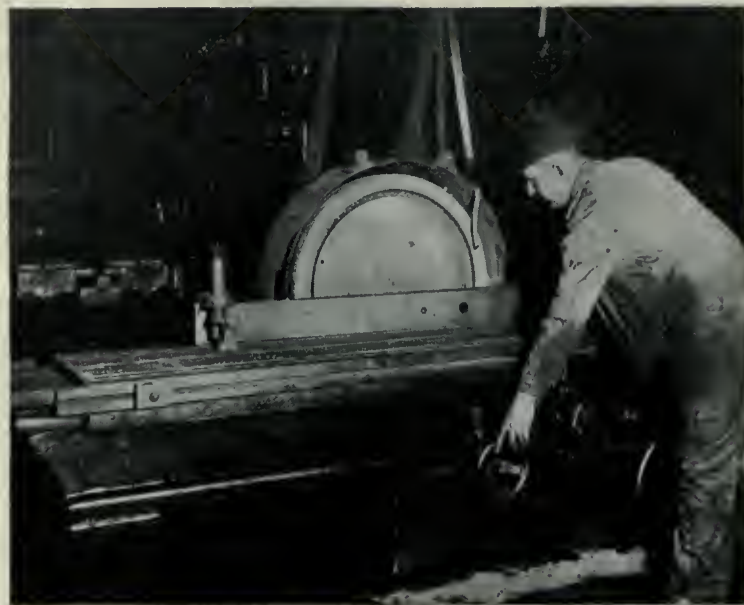
The Grinding Feature in Railroad Shop Equipments

Describing how Guide Bars, Links, Piston Rods and Car Wheels are ground, also the methods used in grinding valves and air brake connections.

SEATED on plush or velour-covered seats in a railway coach, speeding across country at a rate of from fifty to sixty miles an hour, and gazing out upon an ever-changing panorama, the casual traveler rarely takes into consideration the tremendous energy which is expended to make possible such luxurious travel. Very little thought is given to the railroad shop, where almost every piece of equipment which goes to make up a modern railroad train is produced with a view towards increased comfort and efficiency.

To such, a visit to one of these hives of industry is, indeed, a revelation. Almost every trade is represented, and as one is piloted through the various departments he experiences a feeling of bewilderment at the seeming confusion which appears on all sides. Yet there is, probably, no other place where better system is observed than in a railroad shop. If you are interested in grinding, your attention is immediately arrested in the grinding room, to which place every piece of equipment which has to be ground is sent, and not only the equipment but the tools used in producing that equipment are ground here.

The actual grinding operations in a railroad shop are similar to those encountered in other industrial shops, with the exception of guide bar, link, piston-rod and car-wheel grinding, so in this article we will describe these operations in order.



GRINDING A GUIDE BAR ON THE BRIDGEPORT GRINDER.

GRINDING A LINK ON A HAMMET RADIAL GRINDER.

Grinding Guide Bars.

Guide-bar grinding is one of the hardest grinding problems of the railroad shop. As most of our readers are aware, the guide bars are the parts that steady and guide the crossheads in their reciprocating motions. They are fastened to the cylinder heads at one end and to the guide yoke at the other end. As the cylinders and the guide yoke are fastened securely to the main frame of the locomotive, it will be seen that the guide bars are securely supported. This is essential, as there is great strain put on the guide bars by the action of the main rods when they are at their highest and lowest points.

Guide bars are usually made of 40-point carbon steel, and generally case-hardened, for the smaller types of locomotives. Most master mechanics do not consider it good practice to case-harden large guide bars, therefore, the guide bars on large types of locomotives are left soft. It is obvious, however, that a case-hardened guide will outlast one that is left soft.

Grinding does not enter into the manufacture of new guide bars, as they are finished to size on a planer, several guides being planed in one operation. The planer is equipped with two heads on its cross rail, one head doing the roughing, while the other takes the finishing chip. It is after a locomotive is brought off the road into the shop to be overhauled, that the guide bars need the grinder's attention, the grinding operation being to straighten up the surfaces.

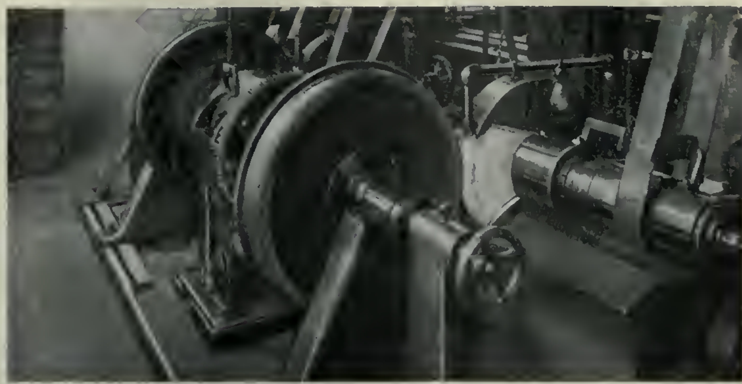
Usually, they are worn from one-sixteenth to one-eighth of an inch out of true, the wear for the most part being in the centre. The grinding is done on special machines, the best-known types of which are simple in construction and easy to operate. The guide bar is strapped to a platen on the bed of the machine, and travels back and forth past the face of the grinding wheel. After each traverse of the work past the grinding wheel, it is fed in slightly. The guide bars are ground on two sides and the face, although, in some shops grinding of the sides is not being done as much as formerly.

A Good Grinding Wheel Essential.

While the actual process of grinding guide bars is quite simple, and does not call for special skill on the part of the operator, yet it is most essential to have a grinding wheel which is adapted to the work. Such a wheel must be of the proper grit and grade, and grind fast without too much wear. It has been the custom until recently to grind these guide bars wet; in fact, in many shops they are still doing the work this way, but the disadvantages of this method, with its resulting dirty conditions, has made welcome anything which would make the operation more congenial. Wheels are now available which fulfil all these requirements, and make it possible to do this work just as well dry as it has formerly been done wet. These are of the cup or ring type, 30 inches in diameter, with a two-inch grinding face.

Link Grinding.

Link motion as applied to locomotives consists of a reversing gear in which the valve rod is connected to a block, called the link block, capable of sliding in a slotted bar controlled by a system of levers. There are two types of link in general use—the solid and the two-piece or saddle link. They are both convex towards the eccentric rods, the gear being changed by raising or lowering the radius rod connecting the link with the valve rod.



THE NORTON CAR WHEEL GRINDER.

The severe strain to which these links are subjected causes them to wear out of true, and they are then sent to the grinding shop to be trued up. This work, like guide-bar grinding, is done on a variety of machines, mostly of the shop-made type. They are, as a rule, built on the pendulum principle, a swinging arm, to which is attached the link, giving the desired radius. The grinding wheel is held in a stationary attachment, the link being applied to its face as the arm swings to and fro. In some shops the links are ground free hand on a large wheel, but where there are a large number to grind this process is slow and tedious.

Of link-grinding machines in use, the Hammet radial grinder has so far been found to be the most effective. In fact, we are given to understand that it is the only machine on the market, the others being of the shop-made types. From the accompanying illustration, a general idea of the construction of this machine and its operation may be gained. As in almost every class of grinding, a grinding machine is no better than its grinding wheel, and in link grinding it is essential in order to insure good results, to have the very best wheel obtainable for this work.

PISTON ROD BEING GROUND ON A NORTON CAP GRINDER.

The links are made of wrought iron, case hardened, being ground on the sides and on the inside, the amount of stock to be removed varying according to their condition. Where there is 1-32nd of an inch stock to be removed, a link can be ground to a good finish in an hour's time.

The wheels which give the best results on the Hammet grinder are from 1 to 4 inches in diameter, and from ¾-inch to 4 inches thick. The wheel speed is 3,328 r.p.m. These wheels are also used on machines of the shop-made type, and the same good results are obtained. In some railroad shops it is customary to place several links together on a spindle and grind them in one operation. Where such a method obtains the operators do not work under piece-work conditions, and no particular time is set for grinding a link or any number of links.

Grinding Piston Rods.

The operation of piston rod grinding is purely a straight cylindrical grinding proposition, into which very little precision work enters. As on guide bars, the greatest wear on piston rods is in the middle, and the work consists of truing the ends down to the diameter of the worn section at the centre. These rods are made of forty-point soft steel, and in grinding them it needs a wheel which will cut clean and fast and will not burn.

A popular machine for grinding piston rods is that which allows the piston rod to be ground without removing the piston head. The part of the rod which has to be ground is 3½ feet long and 3½ inches in diameter, the tapered ends which carry the journals being turned. The wear on these pistons—that is, the amount which has to be ground off, runs anywhere from .015 to 1-16 of an inch, and in some cases it is necessary to grind off at least ⅛ of an inch of stock before the rod is once more true. Before going on the engine, the rod must have a perfectly smooth finish.

Wheels 18 to 24-inch diameter, are used in this service.

Chilled Car Wheel Grinding.

Years ago, when the chilled wheel was in general use on passenger cars, and when the mileage guarantee was much lower than at the present time, the grinding of chilled car wheels was a much more important problem for the railroad shop than at the present day, when the steel car wheel has very largely displaced the chilled wheel in passenger service. The improvement in the manufacture of chilled car wheels both in uniformity of chill and depth of chill, thus increasing the mileage guarantee per car wheel, has caused railroad shops to be relieved of much of the grinding.

A number of important railroad systems in the United States manufacture their own chilled wheels, and where such chilled wheels are of the plain type, very little grinding is needed, unless a standard of size is required. Chilled wheels made by the contracting chill are ribbed across the tread of the wheel in the shape of narrow fins of the metal, which have flown between the contracting plates in molding. These hibs or fins must be ground off, and the tread brought to a smooth, even surface. In this type of wheel considerable grinding is necessary.

Carborundum wheels have been eminently successful in practically all shops where chilled car wheels are ground. One shop in particular, which keeps very accurate records of the cost of grinding car wheels, shows an average cost of less than one cent per car wheel, which speaks for the qualities of carborundum in this type of grinding.

Chilled car wheels, after they have been in service for some time, develop what is known as flat spots. These spots are caused by the wheels skidding on the rails, and, in continued service, the flat spots increase in size by the constant pounding and repeated skidding, until the flat spots are sometimes fully 5-16 of an inch in depth below the circumference of the wheel, and practically the full width of the tread. To secure a reasonable mileage for such wheels, and also to eliminate the wear and tear on the rails, it is necessary to grind the flat spots by reducing the entire circumference of the car wheel tread to the lowest portion of the flat spot. In some shops this work is done by removing the wheel from the axle and regrinding the wheel.

Valves and Air Brake Connections.

To any one but an engineer, a brake valve is a complicated piece of machinery. It is a part of the equipment of a locomotive which requires constant attention, the safety of hundreds of passengers often depending upon its efficient service. After a certain time, the parts of these valves become pitted and worn out of true, and they are then sent to the grinding room to be put in good repair. If the pits are not too deep, this work is very easily done. There are two parts which have to be ground, the valve stem or plug, and the body or seat, into which the stem fits. The valve stems are ground on a steel face plate having a groove down the centre, into which the stem fits. Over the face of the groove, a thin paste, consisting of carborundum grains mixed with oil, or the prepared carborundum valve-grinding compound, is laid. The operator then takes one of the valve plugs and a few rubs up and down the groove is usually sufficient to remove the pits and bring it to true, and it takes only about three minutes to grind one of these plugs. Formerly it was the practice in many shops to use ground glass or emery as the abrasive, but now these materials are very rarely used.

Carborundum grain is almost exclusively used for grinding out the bodies and seats, a special machine being used for this operation. This machine is simple in construction and consists of two perpendicular spindles to each of which is attached a brass valve. Under the table of the machine there is a revolving horizontal spindle to which is attached an eccentric wheel having two knockers . As the wheel revolves, the knockers force the pins up and down. The bodies are placed on the valves, and a paste of oil and carborundum grain added. It then takes but a short time to grind the bodies out evenly and to a fine finish. The grinding time varies from five to fifteen minutes, according to how much the bodies are worn. Angle cocks, blow-out cocks, and equalizing valves for air brake connections are ground in the same manner. In size these run from one-half inch up to one inch an a quarter, and it is possible for an operator to turn out 250 a day on one machine.

The other classes of grinding found in a railroad shop are those of general work, snagging castings, and tool grinding. The latter includes drill, cutter, and reamer, die and small grinding, and is much similar to any other tool-grinding shop. The range of work is large and necessarily there must be a large range of grinding wheels to do the work.

We are indebted to the Carborundum Co., Niagara Falls, N.Y., for the illustrations accompanying this article.

BALL AND ROLLER BEARING MANUFACTURE.

PROBABLY very few persons are aware of the extreme accuracy that is essential in the manufacture of ball and roller bearings. Obviously, however, where millions of balls and rollers are turned out, it is practically impossible to have the limit of error in every one of them exactly the same, despite its desirability. To obviate trouble resulting from such inaccuracy, a new machine has been put into use in the United States.

The rollers are fed on to a rotating steel disc, and passed in turn in front of delicate plungers arranged around the periphery of the disc; these plungers are in fact super-sensitive gauges capable of detecting differences of one-quarter of a ten-thousandth of an inch. When a roller touches a plunger, electrical contact is made, and the mechanism then drops the roller into a canister. The next roller may not touch a gauge until it has made almost the complete circuit, but it must touch one of them, and thus find its way into one of the receptacles. In making up the assembled bearings, all the rollers in any bearing must come from the same canister. thus insuring that all of them are as nearly the same size as human ingenuity can make them.

CANADA'S MANUFACTURING ENTERPRISE.

THAT Canada's manufacturing enterprise compares favorably with that of the United States is well indicated by the following figures. With a population of one-twelfth that of the United States, Canada had 19,218 establishments in 1910, compared with a total of 268,491 across the line in 1909. Ours were capitalized at 1¼ billion dollars; those of the United States 18½ billion. Our wages amounted to $197,000,000 against 3½ billion over there. Our products were nearly 1¼ billion, compared with 20½ billion. Our materials were worth $601,509,000 against nearly 12¼ billion in United States. Thus, our heavy borrowings and adverse trade balance are accounted for by our commercial activity.

UNUSUAL CRANE ACCIDENT.

THE Vulcan gives particulars of a crane accident of an unusual character. It appears that during the working of the crane, the bearings became loose, and one of the rollers flew out, striking a workman on the back of the head with fatal results. At the inquest it was explained that it was a most unusual occurrence for the bearings of a crane to become loose. The displacement of the bearings must have been caused either by the rollers becoming twisted or by some grit which had got in and set up friction which lifted up the ring holding the rollers in position. It would be possible to prevent a recurrence by fixing a guard on the top of the ring.

Plant and Product of the Bawden Machine Co. Ltd., Toronto

This young, but progressive and enterprising concern are now not only in possession of their new shops, but have for some time had them in full and successful operation. Inspection of their plant, equipment and specialties manufactured, and relative to which this article is a racy account, warrant the prophecy that projected additions and extensions will be near future necessities, in order to cope with the increased business now offering.

BAWDEN MACHINE CO., LTD.

THE Bawden Machine Co., Ltd., was established in Toronto over seven years ago by Mr. Fred. W. Bawden, as a general machine shop. The business has grown steadily, new specialties being introduced from time to time, and the latest of these being the "Bawden" steam pump. Such success was attained in marketing this pump that a move to more commodious premises became necessary. Two years ago the company was re-organized, and a site secured in West Toronto, on which an up-to-date factory has been erected, the location being between Sterling Road and the G.T.R. tracks.

Lay-out of Plant.

At present the factory consists of a rectangular brick building 126 ft. long by 50 feet wide, the front part being devoted to general and private offices, with drawing office above. Adjoining the offices, and extending the full length of the building is the machine shop, which is 50 feet wide and about 108 feet long. Above this shop, extending the full length and about 20 feet wide, is a mezzanine floor or gallery, used as a brass finishers' shop. On the north side leading from the machine shop are the tool room, work room, boiler room and blacksmith's shop. The testing room is adjoining the boiler room. At the east end of the site is the pattern storage, 35 ft. by 15 feet, while further along is the pattern shop 50 ft. by 30 ft. The latter is at present isolated, but it is proposed to build an iron foundry between the pattern and machine shops, which, when completed will allow for a continuous movement of work in one direction, handling of work being thereby reduced to a minimum. An assembling department is also contemplated; this will be located near the foundry and machine shop. As the "Bawden" pump is the chief line manufactured, a special building is to be erected on the south side of the machine shop, which will be devoted entirely to the manufacture of pumps.

INTERIOR OF MACHINE SHOP—III.

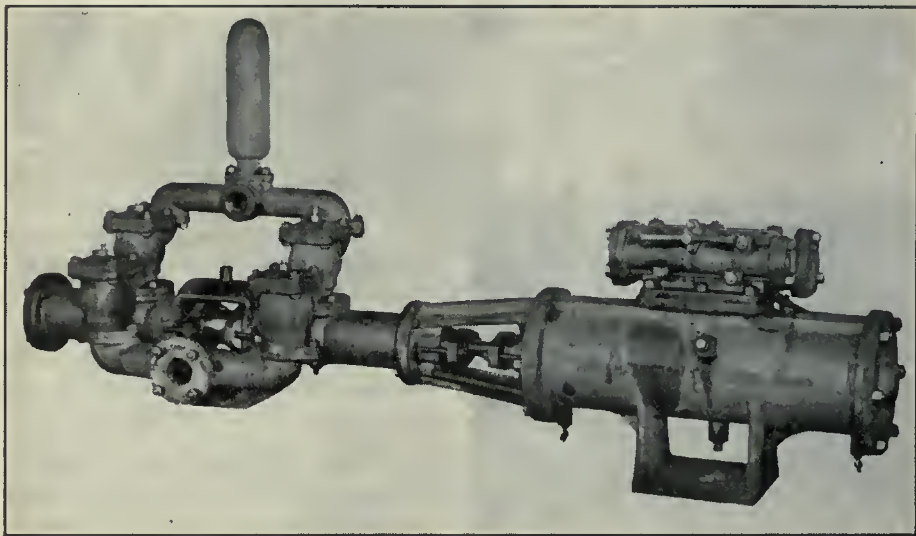
Machine Shop.

The machine shop is well laid out, the machine tools being arranged so that there is plenty of room for the work to be handled; waste space being a minimum. The lighting is good, the windows being large, and fitted with steel sash and wired opaque glass. The machines are driven from three lines of shafting operated by motors using Hydro-Electric power. Benches for the fitters are placed along one wall running the full length of the shop. The tool room is kept in an up-to-date orderly manner, nothing being given out without a signed order. The shop is steam heated by coils located along the walls, the source being a Jenckes Machine Co. boiler.

There are several interesting tools installed, the principal being a "universal" horizontal boring machine by the

EXTERIOR OF BAWDEN MACHINE CO. PLANT..

Universal Boring Machine Co., Hudson, Mass., a machine capable of handling many varieties of work. A No. 3 high speed drill by Baker Bros., Toledo, Ohio, and a 42-in. lathe by the Bradford Machine Tool Co., Cincinnati, Ohio, are located on the south side of the shop. On the north side are to be found a 36-inch vertical boring machine with turret tool head, made by the Gisholt Machine Co., Madison, Wis.; a No. 3 universal milling machine by the Beeke-Brainard Milling Machine Co., Hyde Park, Mass., which is used entirely for milling the tire treads on the inside of the outer mould referred to later; a 36-in. Le Blond heavy duty turret lathe; three 20-in., 14-in., and 7½-in. high speed screw cutting lathes by F. G. Reed & Co., Worcester, Mass.; a 16 ft. planer by the Whitcomb, Blaisdell Co., Worcester, Mass., and two 60 in. and 42 in. triple geared lathes by the New Haven Machine Co., New Haven, Conn.



"BAWDEN" COMPOUND STEAM PUMP.

General.

The machine shop is lighted by 100 Watt "Mazda" tungsten lamps arranged in rows along the aisles and walls overhead. In the other departments, including the offices, 60 Watt lamps are installed. The lamps were supplied and installed by the Rooke-Windler Co., Toronto.

When the additional buildings are erected, industrial tracks will be laid down between the various shops to facilitate the handling of work. At present hoists are suspended from an overhead runway extending the full length of the machine shop. There are also two jib cranes attached to columns, for handling heavy work. About 65 men are on the payroll at the present time, but this number will be increased considerably when the proposed shops are in operation. A wash room for the convenience of the men adjoins the machine shop, in which two rows of cast iron enamelled lavatories have been installed, in addition to other fittings, enabling the men to get cleaned up before leaving for their homes.

The factory being located near the railway, a spur has been laid from the G. T. R. tracks along the front of the building, thereby greatly facilitating the handling and despatch of shipments.

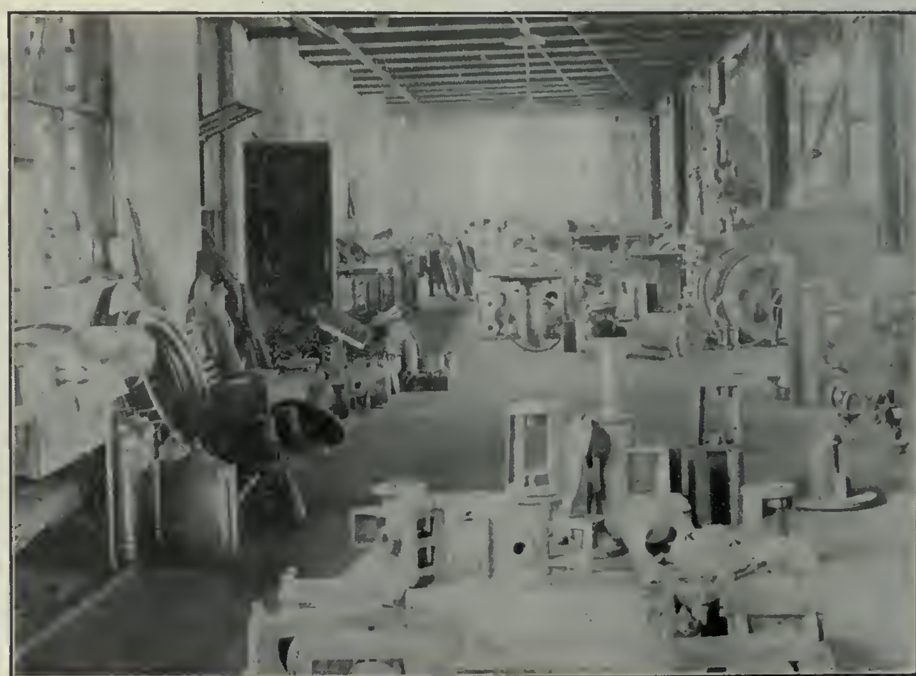
The "Bawden" Pump.

The "Bawden" pump was designed and patented by Mr. W. Atwood, chief draftsman for the company. The design embodies several interesting features which have given very satisfactory results. It is of the simplex type, the steam cylinders being either single or compound. The pump is governed by two piston valves which are controlled by the action of live steam only. Such gear as tappets, levers, springs and rock shafts have been dispensed with. A special feature of the piston valves is the arrangement for catching leakage of steam due to wear and tear.

The steam piston is automatically cushioned at each end of the cylinder by the special design of the two main steam ports, dispensing with all adjusting mechanism. There are no dead centres, and there is no tendency to hang up. It will run under full load at the fastest and lowest speeds, thus providing a flexible pump for all purposes. The single steam cylinder pump has packed water pistons, brass liners and outside valve boxes.

The compound steam pump, shown in the illustration, embodies the same valve features as the single unit, and where greater economy of steam is desired, this type is to be recommended. It has brass liners, and centre packed working barrels, easily accessible as may be noted. The high and low pressure pistons work in one cylinder, the steam and exhaust ports being of the shortest possible length, and so arranged that the high pressure steam passes direct to the low pressure cylinder without the medium of external passages; condensation is thereby reduced to a minimum.

A recent test of a 5-9-4 x 10-inch, compound outside packed pot valve boiler feed pump, for 250 lbs. pressure, gave very satisfactory results. The pump started on 8 lbs. of steam and with 40 lbs. of steam gave 160 lbs. pressure on the water end. There was a steady



INTERIOR O FMACHINE SHOP.—I.

flow of water at all pressures, and the pump made a steady even stroke, there being practically no vibration. The pump was also run as slow as 2 to 3 feet per minute, and made the same even full stroke.

Automobile Tire Molds.

Another interesting line manufactured by the Bawden Co., is the moulds for making the covers of automobile tires. The inner mould or core is of cast iron, and is made to form the inside part of the cover, while the outer mould is made in four sections, each being divided down the centre and bolted together. The inside part is milled to suit the tread of the tire to be made from it. The core and outer mould are held together by two circular cast iron rings, one on each side, forming the side of the tire. All sections are securely bolted together when the rubber compound is being poured.

A motor-driven reciprocating pump is at present being developed, while toolmakers' dies and general engineering work form not unimportant additional fields of enterprise. Fred W. Bawden is manager; H. A. Harrison, sales manager; W. Lawson, superintendent, and W. Attwood, chief draftsman.

THE LIFE OF A MACHINE TOOL.

J. D. SMITH, writing in the "Machine Tool Engineer," says:—There are numerous points from which the life of a machine tool may be considered, and it would be wrong practice, especially from an economical standpoint, to lay down hard-and-fast rules with regard to the life of any tool, assuming, of course, that the rules laid down were to apply to machine tools no matter where they may be.

Features to be Accounted.

Machine tools may be subjected to entirely different conditions, and the same rules laid down for the "scrapping" time of those in a large and up-to-date works, where capital is plentiful, would certainly not be allowed in a private firm where the capital is limited. There always comes a time in the life of them when the advisability of putting them out of commission is discussed by both the foreman and the management. Usually this occurs when there is a heavy run of orders, and the machine is piled up with work.

In some cases, although these are getting more rare every year, there is no machine on the market which will do the job in less time than the old one, especially if the machine has been specially designed for a certain operation; so it is desirable from every standpoint to take into consideration the possibility of obtaining repeat orders of the work in hand before another machine is put down, or whether the present rush is only temporary and due to causes in other departments, which by judicious measures can be avoided in the future.

The Product Delivery.

I have found that the question of "scrapping" old machines and replacing them with new ones is never brought more prominently to the notice of the management than when the output is not up to the promised dates of delivery of the office. When the orders are normal and the plant is quite able to fulfill them to the time promised, nobody seems to bother, and the management do not see the necessity of more outlay, especially if every machine is in working order, and able to do the particular part required of it.

This policy is wrong if there is capital available. The slack time should be used to its full advantage, inquiries made from the various makers of the particular machines desired, and machines installed to replace those which by their age stand at a very low valuation. Such a policy has at least three advantages to justify its adoption.

First, the new machines stand at their full value in the balance-sheet for a year at least, and, therefore, show no loss, the extra work gained by their installation being actual profit.

Secondly, they are there ready when the rush does come, as it will eventually, when trade revives, apart from the fact of their being able to turn out more work than the old ones, thereby reducing the cost, which helps to justify the expenditure.

Thirdly—and not the least advantage, in all probabliity, it is possible to get the machines at a slightly reduced cost from the makers, as, when the manufacturing trade is slack, the machine tool makers are usually likewise situated, quick delivery is obtained, and the installing of the machines can be done without extra wages for overtime, this being a considerable item during a busy

INTERIOR OF MACHINE SHOP.—II.

period, weekends being worked in many cases, when the actual labor cost is doubled.

Installing New Machines.

The first consideration when installing new machines should be the return for the outlay. It may be that the new machine will not produce any more work than the old one in the same time, but it must be remembered that the work done will be more accurate and nearer to standard, and although the cost is the same for machining, it will be reduced in the fitting, as less time will be spent in bringing the articles to the correct sizes.

Then, there is the machine which is guaranteed by the makers to turn out a larger quantity than the old one, in the same time. The advantage gained in more accurate production, this being felt mostly in repetition work, providing tho inspection has been thorough before it is taken over by the purchasers and the specification fulfilled.

When framing specifications for new machines, due regard should be had to the handiness of the different operations. From the operator's point of view, the handier it is, the more conducive to economy. Fixtures for holding work, etc., should be as plain as possible for the results desired, as in many cases, especially on recent machines, the actual cutting time is less than the time taken in preparation, therefore the preparation time should be cut down as fine as possible by handy fixtures, etc., so as to get the fullest cutting time on the machines per day.

The Art of Improvisation a Valuable Factory Asset

By J. T. Towlson

We are afraid that less opportunity exists now than formerly for the display of that genius which asserts itself in an emergency, and pulls the "fat from the fire," as it were, without burnt fingers. In all factories, large and small, irrespective of equipment installed, occasion presents itself, however, and a pleasing feature is that, whether the employees are numbered by tens or by thousands, a genius on improvisation is available to meet it.

IN a general engineering shop, and more especially in the machine-tool section, a mechanic who is able to spontaneously improvise is an asset of no little value. It is a faculty, or an art which cannot be taught or learned from any kind of text book, and is akin to genius. Moreover, men who possess it, without parade of the fact, give unmistakable evidence of its possession, on every possible occasion; while others—the great majority, me-thinks make great parade of their utter disinclination to even endeavor to get through any piece of work—difficult or otherwise, unless every tool—every appliance and all the recognized and orthodox means are provided for them.

A man who can "make things do," and "who can scheme a rig-up," on the spot, is a jewel, and one whom a shop-superintendent appraises at his correct value. Some of us have experienced untellable discomfort at the antics which some men display, when requested to put a particular job through smartly—a break-down in a factory, for instance. They cherish a certain code of "honor," which prevents them rushing a job through—and will be so chary of beginning smartly as to want this and want the other thing ere they can begin.

We also have pleasant experiences of other, but essentially dissimilar, men, who all but anticipate their foreman's wishes—and are on the job, with a rig-up concocted, and are sailing away towards a finish in double-quick time.

The men "who cannot scheme," and who have not the faculty of improvisation, I am rather sorry for, and cannot give them any help; but I should urge the unwilling ones—when a job is really and honestly urgent—to get hold of the fact that it is more honorable, and a more durable satisfaction to push it along with all reasonable speed, than it is to hang hulking about ere a start is made.

"Anything Will Do"—"Nothing Won't."

"Anything will do;" "Nothing won't," is a phrase I have heard many times from the mouth of a genius in improvisation, whether he was making a drawing, launching a vessel, loading a boiler, or getting a locomotive engine back on to the rails.

The first and nearest thing at hand was made to serve in a case of emergency; it may not have been the precisely correct thing for the purpose taken by itself, but, coupled and used with the genius' intelligence, it served its purpose supremely well on every occasion.

Practical Example I.

I saw him once in a goods' yard of a railway station, with a couple of large Galloway boilers to unload from trucks, on to the ground. He had no tackle of any account—only a good rope and a few 3 in. planks. He laid the planks—one end on the edge of the truck, the other end on the ground; and, as he was preparing to roll the boilers towards the planks, he was warned that the planks would break. "I expect they will," he replied, but as he had laid a quantity of sacks, filled with ashes and straw, just under the spot where he knew the planks would break, he just

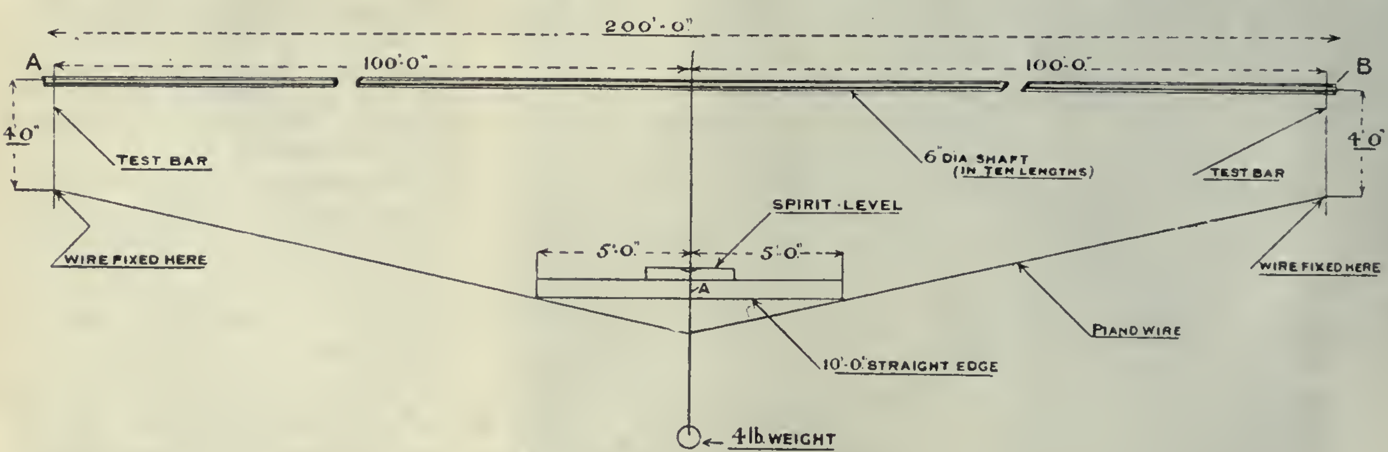


FIG. 1. THE ART OF IMPROVISATION.

parbuckled the rope round the boilers, took two turns round the stop-valve base, and told us to pull away. This we did, and the boiler rolled off, smashed the old planks and fell on to the filled bags, as on to a cushion.' Methinks, equal genius was here evinced, as if he had taken hours to design it, but it was was spontaneous.

Practical Example II.

Another case: The line shafting of a large machine-shop gave evidence of being out of true, and out of level also—too much power being absorbed in overcoming the abnormal friction of its running details. He had the job to test it, and give a report. The management anticipated a big and arduous job, accompanied by considerable overtime; as no one considered it possible to make tests of this nature, while the shaft was running; but this genius of an improvisator was quite equal to getting readings of the out-of-level of the shafting in quick time, and that when the shaft was running. He recognized the fact that records should be taken when the shaft was running, and with all belts on, and power to drive machine being transmitted.

Records were taken of over 2,000 ft. of shafting—in ten different sections, in a few hours, and he had no occasion to touch the shaft, but took his readings from floor level. Obviously, he required to know, at the beginning of his operations, which end of each shaft was the highest; or, in similar manner, which was the lowest. It would be folly, he reasoned, to start from one end to level up, without knowing the respective heights of either end of the shafting. To find this he forecast as follows: (See Fig. 1.)

Apparatus Employed.

The sections being 200 ft. long, he fixed, on to each of the two outer hangers, a mild-steel bar. Projecting downwards, below the shaft, a distance of about 4 ft. 3 in., exactly at a distance of 4 ft., a small hole was drilled in each of the bars, and through these he stretched a length of piano-wire. It was just fixed to the two bars and allowed to sag, as shown—and precisely in the centre of the length of 200 ft., a four-pound weight was suspended by the wire, as shown. A good wood straight-edge, 10 feet long, with a line at the centre of its length, and with a spirit-level combined, was applied, as shown, and the centre line of the straight-edge was made to precisely correspond with the centre of the length of the slack wire; that is, at the spot where the weight was suspended.

Now, it is obvious that if the shaft were level—i.e., each end of similar height, the spirit-level would declare, and record it; but if the end (B) were high, the bubble of the level would approach the end (B); and supposing it required a piece of packing ¼ in. thick under the end of the straight edge (A), to compel the bubble of the level to come to the centre, it would be positive proof that the end of the shaft (B) was high to the extent of ¼ in. in 10 ft., thereby equalling

$$\frac{\frac{1}{4}\text{ in.} \times 100}{10} = 5\text{ in.}$$

in a length of 200 feet.

The particulars were taken in almost as little time as it takes to describe the method, and gave a good basis, from which to proceed with the levelling, or rather testing the level of the various lengths of shafting which served to make up each 200 ft. length. This was done as follows:—(See Fig. 2.)

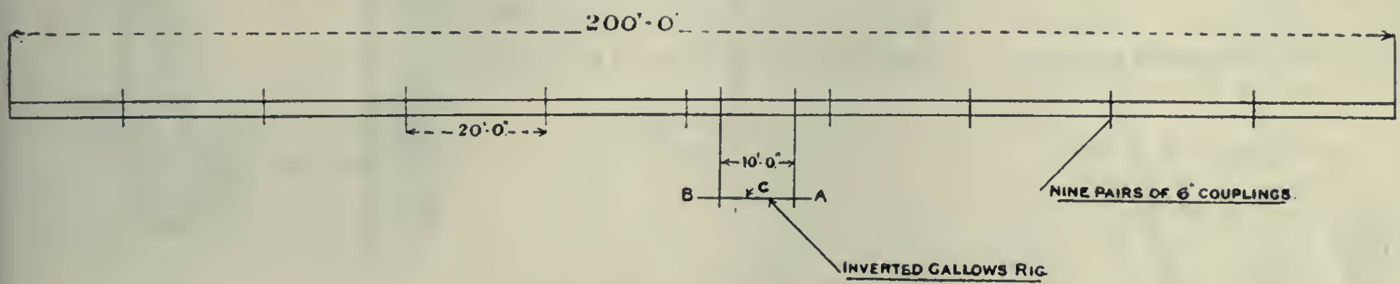


FIG. 2. THE ART OF IMPROVISATION.

Testing the Levels.

The lengths of the shafting were 20 ft., and the hangers about 10 ft. centres. A carefully-constructed inverted gallows rig was acquired, which could be conveniently applied from the floor. The essential feature of the gallows rig was that it could be easily hung from the shafting at places adjacent to the hangers. It was also necessary that the two hanging legs should be of precisely equal length, at least as far as the distance from (A) and (B) to the centre of the shaft was concerned; so that if the shafting, where the rig was applied, was level—a spirit level applied to the true edge of the cross-bar of the gallows would at once declare and record that fact.

If the shaft were not level, the amount of such was recorded by the adjusting apparatus with which modern spirit levels are provided. It was only a question of ratios, to be able to discover from the reading of the level—to what extent the shaft was out in the length of the cross-bar—this length being marked in feet and inches on the bar.

Nothing could be simpler, and with a self-centring grip with which the upper ends of each leg was provided, it was easy to test lengths of shafting of varying diameters, and even when the shaft was running.

HYDRO-ELECTRIC COMMISSION AND CHATS FALLS.

CHIEF Engineer Gaby and Hydraulic Engineer Acres, of the Ontario Hydro-Electric Commission, with Mayor Ellis, M.P.P., of Ottawa, and several engineering experts from Toronto and Montreal, made an inspection trip relative to the water-powers of Chats Falls, on the Ottawa River, some thirty miles west of Ottawa.

Expropriation proceedings instituted by the Hydro-Electric Commission are pending before the Ontario Railway and Municipal Board, with a view to taking over the present power rights held by Hardy and O'Connor at Chats Falls under a lease granted by the Federal Government in 1911. The Ontario Government has offered $420,000 to the present owners, but they ask three million dollars. The evidence in the case will be heard in September.

The inspection trip was made with a view to enabling the appraisers for the Hydro-Electric Commission to get first-hand information as to the power development possible, and the value of the lease now held by Hardy and O'Connor. The Ontario Government intends to use Chats Falls power as an extension of the Provincial power system for the Ottawa Valley and Eastern Ontario. Over 100,000 horsepower can be developed at the Chats and Ottawa, and the whole surrounding district is vitally interested in the move now under way for insuring cheap power through Provincial development at the Falls.

Practical Data Relative to the Erection of Shafting

By Joseph Horner

Shafting for the transmission of power through belts, ropes ,gears, etc., forms a prominent feature of our factories and industrial plants generally. The necessity of giving its installation more than ordinary attention, and the points to be observed when doing so, are fully dealt with by the writer in the accompanying article.

THE present article is the second and concluding portion of the subject, the previous one published on July 10 covering the features of erection difficulties, weak shafts, influence of wear, shafting layout, erection methods, etc.

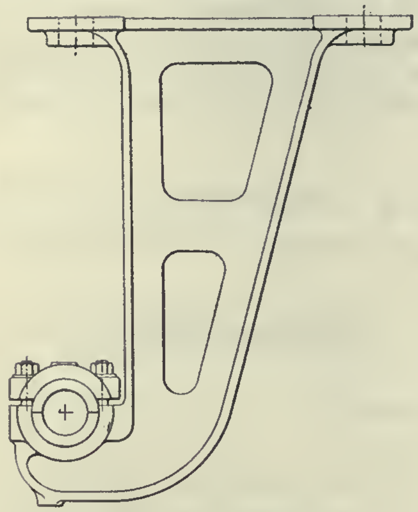


FIG. 12—HANGER BEARING.

Hanger Bearings.

The same methods of plumbing from centre lines laid down on the floor, described in the previous article, are adopted when, as is common, the hanger type of bearing, Figs. 12 and 13, is used bolted to the lower sides of beams. A similar templet is used for locating the center, and the position of the bolt holes, and similar packing pieces are used for adjusting the horizontal alignment of the bearings. A parallel straight-edge is laid along from bearing to bearing, and the height is tested and corrected with a spirit level. The shaft, when afterwards put in, is tested similarly, and also plumbed up from the centre line.

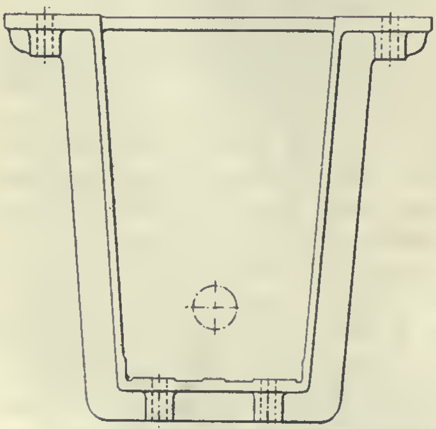


FIG. 13.—HANGER FOR SEPARATE PLUMMER BLOCK.

Swivel Bearings.

When swivel self-adjusting bearings, Fig. 14, are fitted, the same methods as the foregoing are gone through, but not quite the same amount of care is necessary in effecting the horizontal alignment, because the adjusting screws can be used for slight corrections for height, but only, however, to a small amount, in some types, within the range of the setting screws. The lateral adjustments must be exact, as the central axis of the bearing is unalterable in that direction. When that is fixed, the swivel provides accommodation for unequal wear.

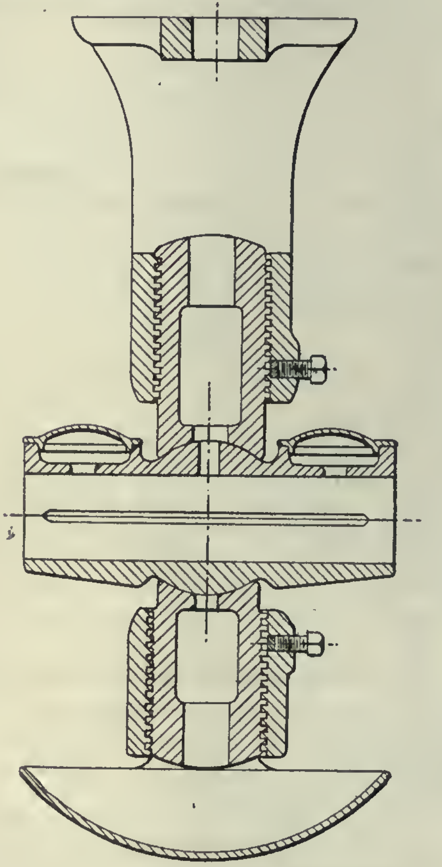


FIG. 14.—ADJUSTABLE SWIVEL BEARING

The Use of Targets.

An old method of erecting shafting, alternative to plumbing from lines on the floor, is by means of targets, or pieces of wood bolted to, and standing out from the joists adjacent to the bearings. This is convenient to adopt when the floor is crowded with machines. The two end bearings are first bolted up in place in positions corresponding with the ends of the shaft. There need be no difficulty in locating two end bearings. Then, as many targets are prepared as there are bearings to be fitted, and one is fixed on a beam adjacent to each bearing in any way convenient.

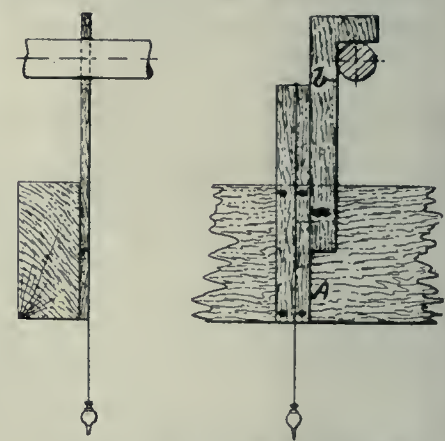


FIG. 15.—TEMPLET FOR PLUMMER BLOCKS.

They can be fitted to horizontal joists or to vertical columns. No hard and fast method need be adopted, but details will vary. Three variations are shown.

Fig. 15 is suitable for plummer blocks bolted on top of a beam; Fig. 16 for a hang down bearing, and Fig. 17 for a wall type of bearing bolted to a column. The point is that one edge (A) is vertical, a datum edge, from which lateral settings can be made. It is set plumb by a bob line suspended from a notch until it coincides exactly with a line drawn parallel with the edge (A). The

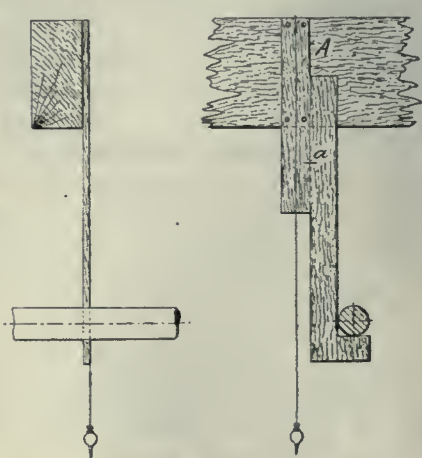


FIG. 16—TEMPLET FOR HANGERS.

position o fthe edge (A) relatively to the shaft is of no importance. It may be 3 in. or 1 in. away, but the strip must be long enough to afford sufficient guidance to the second strip, say from 2 ft. to 3 ft. Also, the edges (A) will all be set exactly in line from the end bearings before being screwed finally. This will be done by stretching a straining line from end to end, standing out to a definite distance from the centres of the end bearings, from which line the edges (A) will be measured with a strip of wood all equidistantly. The vertical datum line will thus be set by the edge (A) of each piece, and all from the end bearings, the location of which is already fixed.

The next stage is to settle a horizontal datum line along the edges (A). Here also, position is not of importance but it is as well to have it a foot or eighteen inches from the shaft. This cannot be marked quite so accurately with a straining line as by the use of the level, though as stated in the previous article, a straining line fixed at one end and pulled taut by a suspended weight at the other the line passing over a pulley, will, in a shop of moderate length, have no perceptible sag. The safer way, however, is to tack a light straightedge on the faces (A) of the targets, taking two or three adjacent and starting from one end bearing and levelling with a spirit level, and thence marking the line (A) on the edge A of each target.

Now it is readily seen that the attachment of such a templet alongside each bearing, the edge of each one of which is equidistant from a strained line, and having the horizontal lines all marked at the same height as those on the end targets, affords a ready means for very approximate measurements for the positions of the successive bearings. From their edges and these lines, a square shaped templet (B) can be used set against the vertical edge, to locate the shaft and the bearing block.

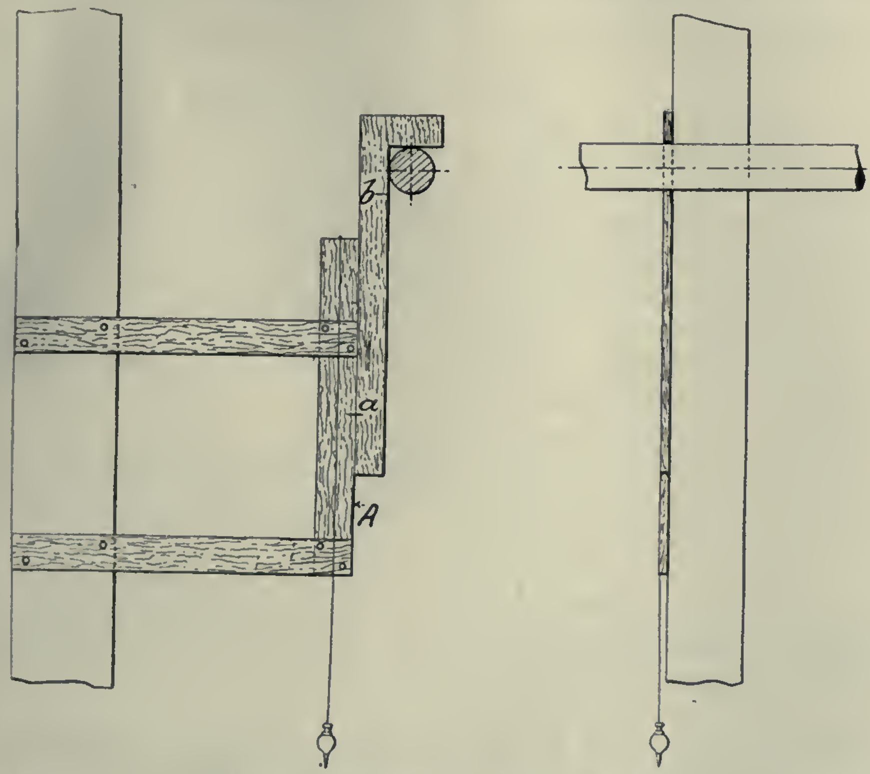


FIG. 17—TEMPLET FOR WALL BRACKET.

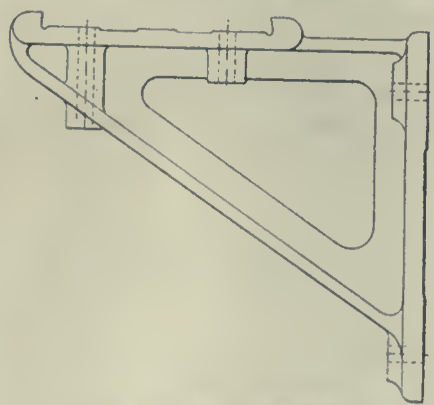


FIG. 18—WALL BRACKET.

Referring to Figs. 15, 16, 17, the method adopted in these is to use a square (B) cut to fit exactly over the shaft in the angle of the square, where a line on the edge is brought to correspond with the datum line (A) on the target. An earlier stage is represented by the line (b) which corresponds with the bottom of the shaft bearing in the pedestal, and which may be used when the packing strips are being planed for setting the vertical positions of the plummer blocks, hangdowns, or wall brackets.

Variations in details are merely matters of convenience to be modified in different cases. The essentials are the alignment of the edges (A) and of the lines (a). After the shafts are in place in their bearings, they can be checked for level by means of a spirit level, and slight corrections made if required by means of the packings under the bearing blocks or brackets, and for horizontal alignment by means of a straining line.

Rigid v. Swivelling Bearings.

If sufficient care is taken in aligning rigid bearings with plumb line and spirit level, they are not so unsatisfactory as the manufacturers of swivelling adjustable bearings say they are. I have known them running for very many years without giving any trouble whatever, merely entailing the renewal of a brass here and there at long intervals. This, of course, presupposes shafts of diameters large enough for their work, bearings placed sufficiently near together, accurately fitting couplings, and pulleys and gears hung properly, in addition to careful alignment.

However, even working under the best conditions, these rigid bearings are not to be recommended because they do not embody the best proportions of length to diameter. Being rigid, an ample length cannot be imparted without increasing the difficulties of aligning. In a swivel bearing, again, the weight and friction of the shaft are distributed over an area of about twice that obtainable in a rigid bearing. The mathematical demonstrations do not concern us here in an account of the methods of erection and the results obtained.

The foregoing remarks apply to bearings carried on any horizontal supports, whether on the timber beams of roof

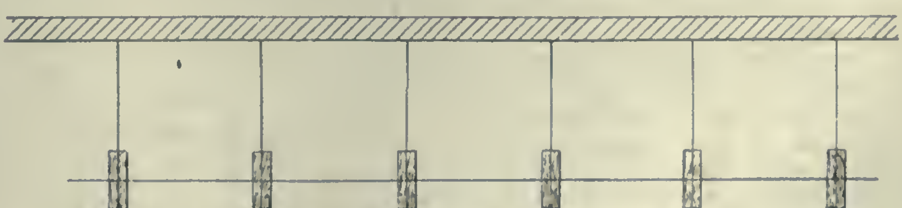


FIG. 19—LAYING DOWN CENTRES FOR WALL BRACKETS ON FLOOR.

principals or longitudinal beams or girders of wood or steel placed for the purpose of carrying bearings, or on supports in the lattice braced pillars which carry the roof principals or the gantries of travelling cranes. The condition is that the bearings are bolted down, or up, to horizontal supports and have no provision for adjustment for height.

Bearings in Wall Brackets.

Large quantities of shafting are carried in bearings supported on brackets bolted to walls. In these too, the bearings are either rigid, or they swivel and are adjustable. The methods of alignment previously explained are adopted after the brackets have been bolted up to the wall. This is done in the following manner:—

The centre line of the shaft being snapped on the floor, the centres of the brackets are marked across these at right angles up as far as the wall, Fig. 19. There, these are raised by a chalked plumb line set over each centre line in succession, and held at top and bottom and snapped, so transferring the lines to the wall Fig. 20. Measurement is then made up from the datum blocks on the floor, Fig. 19, to the wall, to the centre line of the shaft, using a rigid rod for the purpose. Then a line, (A) Fig. 20, is drawn along on the wall using a parallel straightedge and a scribe, and checking the horizontal truth of the straightedge with a spirit level. This will be the line of the shafting in its horizontal plane; or in some circumstances, it may be better to draw a datum line a foot or two above the floor, and measure the shaft line from that.

A templet (B) is made from the brackets corresponding with the feet. Along it, the centre line of the bracket is scribed, and across it the centre line of the shaft, and then the bolt holes are bored in their correct positions in relation to these lines. This templet is laid over the centre lines on the wall, and set to them by its centre lines, and the bolt holes are then marked off directly through it and drilled. The brackets are bolted up in succession, but each is adjusted from its predecessors by means of a parallel straightedge and level before all are made fast. Any slight subsequent adjustments are made in the bearings bolted to them subsequently by the methods already explained, that is, with plumb line, straightedge, and level.

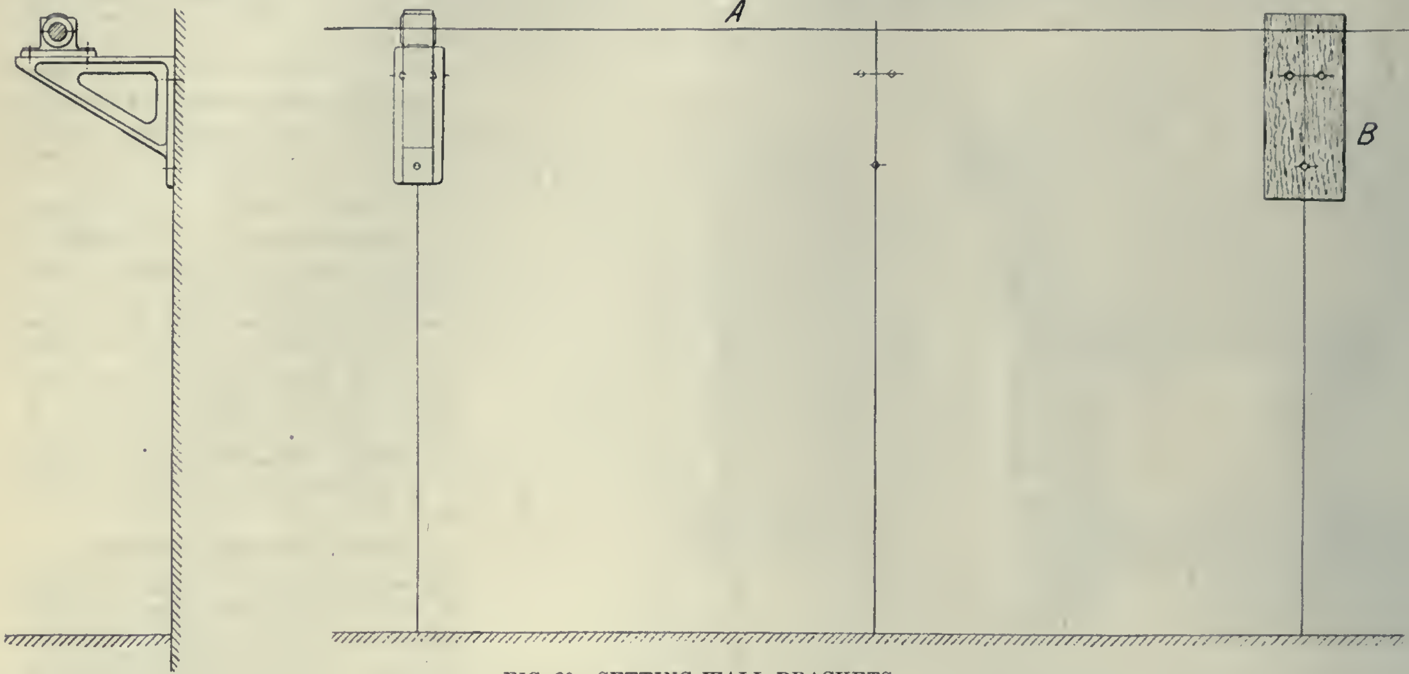


FIG. 20.—SETTING WALL BRACKETS.

Bearings on Steel Columns.

Brackets are bolted against the lattice braced steel columns which support roofs. This does not alter the method of lining out and fitting. The work is more awkward when they are fitted to round columns, as this requires a concave foot to the bracket, and a concave cap to bolt it up by, the bolts passing through lugs. Except that there are no bolt holes to be marked on the pillar, the general procedure as to centre lines and adjustments is similar to that already described.

Wall Boxes.

The fitting of wall boxes Fig. 22, may include one or more in line. In these a range of horizontal adjustment of the bearing in the box is provided, so that

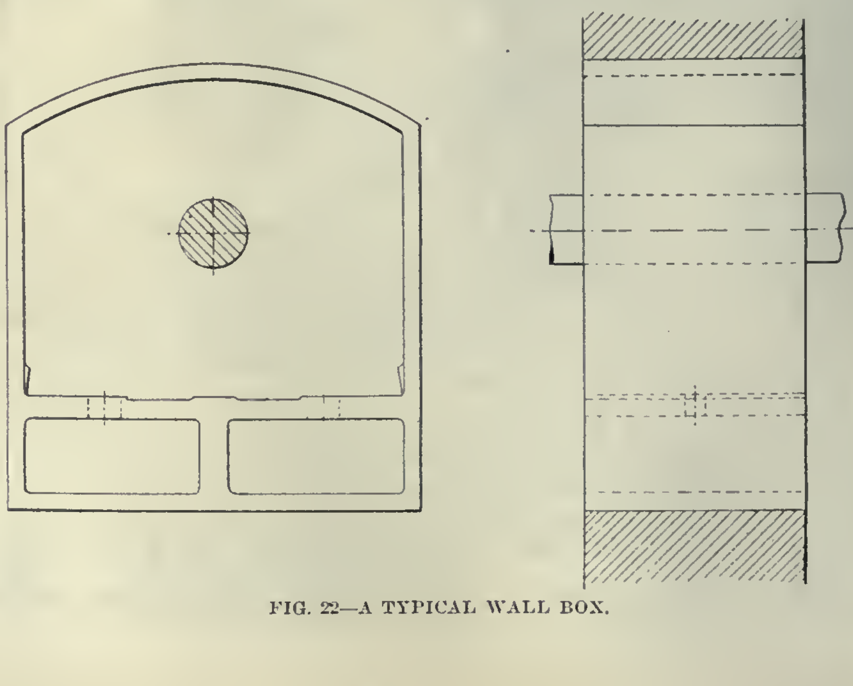


FIG. 22—A TYPICAL WALL BOX.

the fitting of the box itself is only made approximately correct. The actual bearing must be adjusted exactly with level and plumb line after the shaft is laid in, but a close preliminary adjustment can be made in the bearings with a straightedge laid from the bottom of that to the one adjacent, and tested with a spirit level.

Shafting in Crowded Shops.

If new shafting has to be put in a shop which is already crowded with machines, so that the floor cannot be used properly, the work is rather more awkward. There is usually some floor space available underneath the intended new shafting, and, if so, this can be utilized. Two plumb lines can be dropped, one

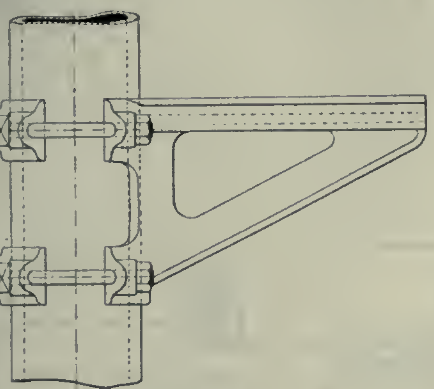


FIG 21—BRACKET ATTACHED TO COLUMN.

from an adjacent existing shaft, and another representing the place of the new shaft. These can be dropped in the two extreme positions, the distance apart measured with a rod, and the positions marked up on the beams, after which the procedure will be as before. If, however, a new line of shaft has to be erected over existing machines, the positions at the ends will be obtained by direct measurement from another shaft adjacent, using a rod for the purpose, and the centre lines will be marked on the beams with a scribe or by snapping a chalk line. No difficulties can arise which cannot be dealt with by making use of spirit level and plumb bob and rigid rods.

MEDICINE HAT INDUSTRIAL ACTIVITIES.

THE publicity authorities of the City of Medicine Hat, Alberta, have furnished the following particulars with regard to the many industrial ventures starting in that city.

After many months spent in construction, setting equipment and machinery making moulds, and trying out the various departments of the factory, the Medicine Hat Pottery Co. is now in full operation and is turning out stone ware that is pronounced second to none ever brought into Alberta. The product consists of butter crocks, mixing bowls, demijohns, jugs, flower pots, hanging baskets, etc., in all the various sizes demanded by the trade in Western Canada. This week the traveller for this company booked orders for ten carloads of stone ware in one day, showing that the demand is all and more than was anticipated.

Probably the busiest place in Alberta to-day is the works of Martin & Phillips, proprietors of the International Supply Co., well diggers and dealers in supplies for that purpose. The company recently secured a contract from the city of Medicine Hat for sinking nine natural gas wells, besides which the concern has contracts for four other wells at outside points. On the former contract Manager Martin now has three rigs in use, and more will be installed if needed. The foundry and machine shop of the company has been doubled in size this year, and there is none too much room now to care for the orders constantly coming in.

The foundry of the Medicine Hat Pump and Brass Mfg. Co. has been in use for a time by the International Supply Co. while the latter's new foundry addition was being constructed, and while the equipment and patterns for the former were being manufactured and sent forward. It is expected now that the pump and brass works will be in full operation in the course of two or three weeks, after many delays that could not be foreseen.

The Brick Co.

Installing of machinery at the enlarged works of the Medicine Hat Brick Co. is now nearly completed. A dozen or more carloads of equipment have been added to the plant, and the capacity for turning out stiff-mud, wire-cut brick will be around 60,000,000 annually. The latest and most up-to-date machinery has been secured, and the company is already making shipments to points all over Saskatchewan and Alberta.

Another furnace has been added to the equipment of the Alberta Iron Rolling Mills, to enable the management to keep up with the orders constantly coming in to this busy establishment, where over 100 men are constantly employed.

Brick work has been about completed on the main structure of the Medicine Hat Concrete Products Co., the building being 50 x 150 feet in size. The roof is now being put on, and the company is about ready to fill some of the orders which it has on hand.

Cement Plant.

Manager J. E. Davies, of the Alberta Foundry and Machine Co., who added to the pattern shop and other buildings this year, and also put in considerably more machinery, keeps his full force at work with the many orders which are constantly coming in from many outside points, as well as locally.

Detailed plans and specifications for the great works of the Canada Cement Co., which will have a capacity of 4,000 barrels daily when completed, are now nearly done. Meantime a force of workmen has been busy erecting bunk and mess houses, storehouses, warehouse, office, etc., and large quantities of stores, machinery and building equipment are being received. Shortly the physical work of construction will be started on the main buildings of the plant, which will cover ten or twelve acres when several hundred men will be given steady employment for something like a year.

AUTOS FOR CONTRACTORS.

IN the final spurt to complete the Canadian Northern main line from the head of the Great Lakes to Sudbury, a distance of about 500 miles, Foley Bros. who have the main contract for the construction work, have put into service seven big automobiles, which are equipped to run along the rails as accurately and at as great speed as the average locomotive.

It is the first time that automobiles so equipped have figured in railway construction work in the west, and according to Mr. C. Foley, of the firm of Foley Bros., they have proved successful beyond all expectations. Cars in which workmen are taken to and from work and in which supplies are carried, are drawn by the automobiles, which on occasion attain a speed of thirty miles an hour.

Mr. Foley, who arrived in one of the cars from Nepigon this week, said that present indications are that the main line will be completed through to Sudbury early this winter, in ample time to handle a share of the new grain crop.

BOVING & CO., OF CANADA, LTD.

BOVING & CO., of Canada, Ltd., who recently acquired works at Lindsay, Ontario, have been awarded the contract by the Hydro-Electric Power Commission of Ontario for the hydraulic equipment at Wasdells Falls.

Their designs are supplied by their affiliated Companies in London, England, and Sweden, and it is satisfactory to note that in future their machinery will be turned out at the Lindsay Works; the units required by the Hydro Electric Commission being the first large job to go into these shops.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

REAMERS AND SHELL REAMER BAR SIZES.

By F. Scriber.

THE practice which has come into vogue in recent years of buying different parts of tools which are required to work together on a machine job necessitates a more general knowledge of the sizes of tools which the different makers carry in stock and their dimensions, so as to enable the user to select those which he can make cheapest in his own shop, and go ahead with them, while the other tools are being bought.

The accompanying table, "Arbor for Shell Reamers," gives dimensions of the arbor and clutch collar for "Morse" reamers, from 4 in. to 6 in. diameter, which are used for making reamers, or can be employed in part for making up special arbors, an application of which is shown by Fig. 1. This is an arbor, having a floating holder for the shank and a pilot at the end for holding the reamer in correct alignment to the work. The reamer is a standard one and is bought by the customer, while the arbor is furnished for the job by the machine tool builder, and the two must go together when received at the customers' works, this being made possible by the use of the table for getting the sizes.

SIZES OF SHANKS ON MORSE #119 REAMERS.

REAMER SIZE A	LENGTH B.	DIAM. SHANK C	LENGTH SHANK D.	LENGTH FLUTE E	REAMER SIZE A	LENGTH B	DIAM. SHANK C	LENGTH SHANK. D	LENGTH FLUTES E
1/4	6	7/32	4 1/2	1 1/2	1 7/32	11	1	8 1/8	2 7/8
9/32	"	"	"	"	1 1/4	11 1/2	1 1/8	8 1/2	3
5/16	"	9/32	"	"	1 5/16	"	"	"	"
11/32	"	"	"	"	1 3/8	12	"	8 3/4	3 1/4
3/8	7	5/16	5 1/4	1 3/4	1 7/16	"	"	"	"
13/32	"	"	"	"	1 1/2	12 1/2	"	9	3 1/2
7/16	"	3/8	"	"	1 9/16	"	"	"	"
15/32	"	"	"	"	1 5/8	13	1 1/4	9 1/4	3 3/4
1/2	8	7/16	6"	2	1 11/16	"	"	"	"
17/32	"	"	"	"	1 3/4	13 1/2	"	9 1/2	4
9/16	"	"	"	"	1 13/16	"	"	"	"
19/32	"	"	"	"	1 7/8	14	"	9 3/4	4 1/4
5/8	9	9/16	6 3/4	2 1/4	1 15/16	"		"	"
21/32	"	"	"	"	2	"	"	"	"
11/16	"	"	"	"	2 1/16	14 1/2	1 1/2	10	4 1/2
23/32	"	"	"	"	2 1/8	"	"	"	"
3/4	9 1/2	5/8	7	2 1/2	2 3/16	"	"	"	"
25/32	"	"	"	"	2 1/4	"	"	"	"
13/16	"	"	"	"	2 5/16	15	"	10 1/4	4 3/4
27/32	"	"	"	"	2 3/8	"	"	"	"
7/8	10	3/4	7 3/8	2 5/8	2 7/16	"	"	"	"
29/32	"	"	"	"	2 1/2	"	"	"	"
15/16	"	"	"	"	2 9/16	15 1/2	"	10 1/2	5
31/32	"	"	"	"	2 5/8	"	"	"	"
1	10 1/2	7/8	7 3/4	2 3/4	2 11/16	"	"	"	"
1 1/32	"	"	"	"	2 3/4	"	"	"	"
1 1/16	"	"	"	"	2 13/16	16	"	10 3/4	5 1/4
1 3/32	"	"	"	"	2 7/8	"	"	"	"
1 1/8	11	1	8 1/8	2 7/8	2 15/16	"	"	"	"
1 5/32	"	"	"	"	3	"	"	"	"
1 3/16	"	"	"	"					

SHANKS FOR FLUTED CHUCKING REAMERS.

Another table which the writer has found very useful is that of "Shanks for Fluted Chucking Reamers." This is not only valuable when making up reamers, but is also handy to have when making up floating reamer bushings and reamer bushings (shown with reamers in place by Fig. 2 of this article). By referring to the table, the diameter of the shank (C) can be found for the size reamer used, this being the diameter of the hole in the plain bushing, while the hole in the floating bushing is made larger to give a floating fit.

As will be noticed at the top of these tables, the sizes given conform to the standard practice of the "Morse Twist Drill and Machine Co.," and are similar to tables used by the writer.

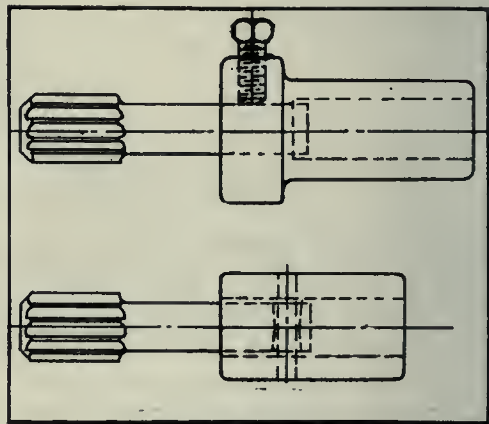


FIG. 2. REAMER BUSHINGS, PLAIN AND FLOATING.

EXAMPLES OF IMPOSSIBLE CONSTRUCTION.

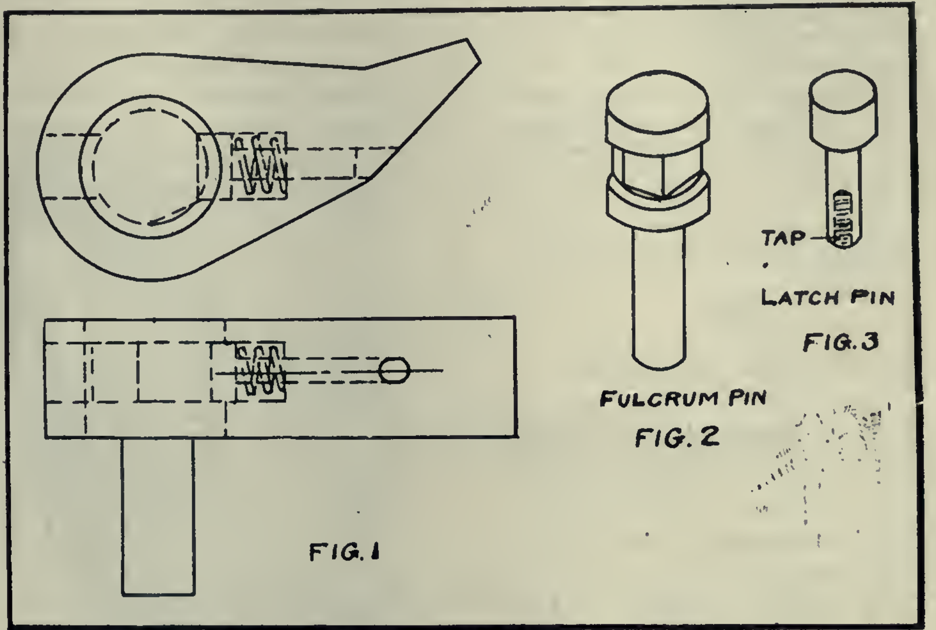
IN a standard work on machine design are given a number of general rules relating to the underlying principles of design and construction. Prominent among these will be found one as follows:—"Avoid impossible construction, i.e., constructions which cannot be assembled or disassembled." At first thought, one would say that such a rule is unnecessary for no one would do such a thing; and probably no one would knowingly, or rather thinkingly, but it is a fact that incompetent persons have produced such designs, and that competent persons have, in times of rush and special stress, done the same thing, and these designs have been worked into iron and steel with expensive and humiliating results.

In dismantling some machinery for removal, the writer ran across two interesting examples of impossible construction which will be described. Both are hidden pitfalls for the designer—one is so neat and substantial as to be really termed a clever piece of work; and the other is so simple (to construct) that no one would become suspicious until assembling was to be done.

The "feed" of several parts on a bundling machine was by means of ratchet wheels actuated by spring pawls. One of these pawls is shown in Fig. 1. The fulcrum pin is "necked" in its centre where it fits into the pawl, and on this neck are milled flats for the pawl pin, in working and release positions. The pin had the usual spring behind it, its stem and the spring working in drilled holes in the pawl. In operation, these pawls could not be improved upon, and their neat design was a delight to the eye.

It was found impossible, however, to take them apart, and we had to destroy the fulcrum pins and make new ones. Before setting up in the new location, we made sure that each latch pin had a hole drilled and tapped in its stem, so that a screw could be inserted to back them away from the neck.

On the same machine was a 2½ in. shaft that had to be removed. This turned in babbitted bearings and was supposed to be easy to take out; but it didn't come, and driving didn't start it. Finally, after wasting a couple of hours in speculation and experiment, the babbitt was melted out. To our surprise, we beheld two V-beads in each bearing. The designer had "designed" a neat and easy construction without resorting to shoulders, unsightly collars, or split bearings, but had totally forgotten the sure-to-come time of removal.



PAWL CONSTRUCTION THAT COULD NOT BE DISASSEMBLED.

SPRING TESTING FIXTURE.

By A. L. Monrad.

SOME time ago it became necessary to make a gauge for inspection of coil springs of various lengths and tensile strengths. The tension of these springs required to be extremely accurate, and as this instrument will detect any inaccuracy within its reach, and has proven it worth so fully, the fixture will doubtless be of some interest to readers of Canadian Machinery.

The coil springs here described are all made of tempered steel wire for open or compress spring. In manufacturing these, an attempt was made to determine the co-efficient of torsional elasticity, the safe stress for different sizes of wire, and different ratios of mean diameter of spring to diameter of wire. Every spring, before testing for capacity and deflection, was first closed coil to coil on an arbor to keep it straight, and put several times in a hydraulic press to remove all permanent set. It was then tested for capacity and corresponding deflection. Springs of small diameter may safely be subjected to a higher stress than those of larger diameter.

Detail of Fixture.

On top of a cast iron plate (A) one inch thick, and planed top and bottom, is fitted in the steel block (B), the indicator pointer (C). This block is secured to the plate with 3 screws and 2 dowel pins. The indicator body fits the slot in the block, and is held stationary with two set screws (D). In about the middle of indicator, and in machined square is a seat for a swivel spiral spring arbor (E), which oscillates freely upon a plug end without any support from underneath, and so is arranged that the

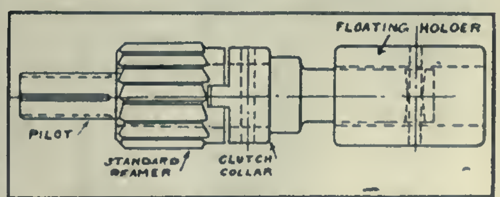
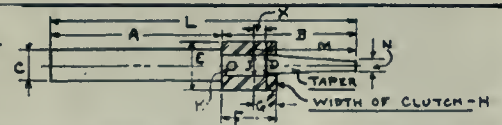


FIG. 1. SPECIAL SHELL ARBOR.

ARBORS FOR SHELL REAMERS
ROSE & FLUTED.-#125A

ADAPTED FOR USE WITH MORSE STYLE, SHELL REAMERS.



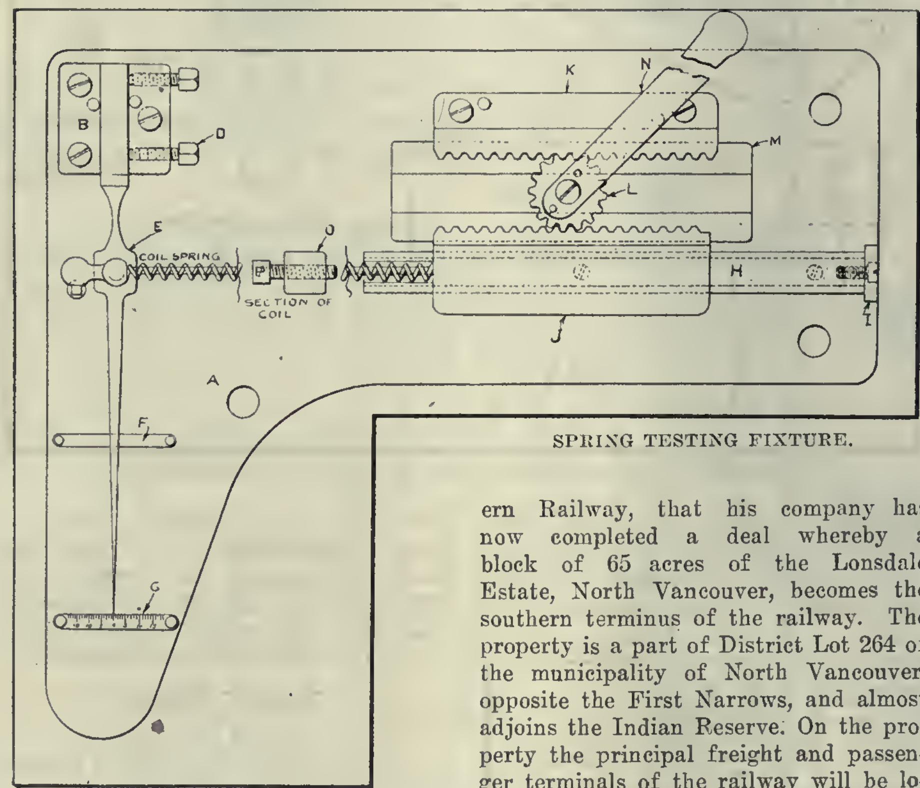
No of Arbor	Fitting Sizes of Shell Reamers #1174 #1174	Whole Length	Shank Diam	Shank Len.	Nose Diam	Nose Len	Reamer Goes On	Clutch Collar Diam	Clutch Collar Len	Clutch Collar Width	Clutch Collar Len.	Clutch Collar Diam.	Rivet Diam	Rivet Cutt. in Length		Nose Diam.	Nose Taper per Ft.
		L	C	A	D	B	M	E	F	H	G	J	K		X	N	
1	1/4-5/16	6"	7/32	4 3/32	.148	1 23/32	1 15/32	7/32	31/64	.060	5/64	.148	1/16	5/16	1/32	.1295	.1512
2	3/8-7/16	7	5/16	4 13/16	.196	2 3/16	1 31/32	11/32	25/64	.0857	7/64	.196	3/32	15/32	"	.1744	.1508
3	1/2-9/16	8	7/16	5 1/2	1/4	2 1/2	1 15/16	15/32	5/8	.117	1/8	1/4	1/8	19/32	1/16	.2280	.1368
4	5/8-11/16	9	1/2	6 5/32	.369	2 27/32	2 3/16	19/32	3/4	9/64	5/32	.369	5/32	23/32	"	.3444	.13488
5	3/4-15/16	9 1/2	5/8	6 1/32	1/2	3 5/32	2 7/16	23/32	7/8	11/64	7/32	1/2	3/16	27/32	"	.472	.13824
6.	1-1 1/4	10	3/4	6 15/32	5/8	3 17/32	2 31/32	15/16	1	"	"	5/8	7/32	1 1/16	3/32	.5948	.13663
7	1 5/16-1 5/8	11	7/8	7 5/32	3/4	3 27/32	2 29/32	1 1/4	1 1/8	15/64	9/32	3/4	1/4	1 3/8	"	.7175	.13435
8	1 11/16-2	12	1 1/8	7 17/32	1	4 15/32	3 1/8	1 5/8	1 1/4	"	"	1	9/32	1 3/4	1/8	.9605	.1406
9	2 1/16-2 1/2	13	1 3/8	8 7/32	1.249	4 25/32	3 5/8	2	1 3/8	19/64	11/32	1.249	5/16	2 1/8	"	1.208	.13576
10	2 9/16-3	14	1 5/8	8 27/32	1.5072	5 5/32	3 7/8	2 1/2	1 1/2	"	"	1.507	11/32	2 5/8	"	1.4627	.13716
11	3 1/16-3 1/2	15	2	9 5/32	1 3/4	5 27/32	4 3/8	3	1 3/4	23/64	13/32	1 3/4	3/8	3 1/8	"	1.698	.1426
12	3 9/16-4	16	2 1/8	9 15/32	2	6 17/32	4 7/8	3 1/2	2	31/64	15/32	2	7/16	3 5/8	"	1.9492	.1252
13	4 1/16-4 1/2	17	2 3/8	9 31/32	2.250	7 3/32	5 3/8	4	2 1/4	"	"	2.249	1/2	4 1/8	"	2.1943	.1222
14	4 9/16-5	18	2 5/8	10 1/16	2.500	7 15/16	5 7/8	4 1/2	2 1/2	39/64	9/16	2.499	"	4 5/8	"	2.4396	.1225
15	5 1/16-5 1/2	19	3	10 9/16	2.750	8 7/16	6 3/8	5	"	"	"	2 3/4	"	5 1/8	"	2.6773	.1369
16	5 9/16-6	20	3 1/4	11 1/16	3.001	8 13/16	6 7/8	5 1/2	"	"	"	3	"	5 5/8	"	2.9227	.1349

ARBORS FOR SHELL REAMERS—ROSE AND FLUTED.

spring arbor can be taken out at will. On the other end of the indicator point is placed a support for a plate (F), held on 2 pins. The indicator point itself rests on a division plate (G), also located on two pins.

A dovetailed steel slide bar (H) is placed and held in position with 2 cap screws, and a stop (I) is located on the end with a screw. On top of this dovetailed steel bar is fitted a cast iron slide (J) with a rack cut in on one side. This has a duplicate (K) on the other side and two dowel pins. Between these two racks is placed a pinion gear (L) on to a cast iron T slide (M), with a screw through the handle (N), held with two pins to the gear.

The handle (N) is moved forward, with a spiral spring on the arbor, against the end of slide (J), until it comes to a stop (O). This can be adjusted by set screw (P), with a master spring in position, until the indicator reads to zero. Any difference of tension between the spring tested and the model spring is recorded very accurately on the graduated division plate.



SPRING TESTING FIXTURE.

CROP CONDITIONS NORMAL.

HARVEST has commenced in Ontario and Southern Alberta. Cutting will be general in the West by the middle of August, despite the prophecy of a late harvest by self-constituted experts. The weather generally during the past week has continued to be favorable, and it is quite normal weather for the West. Districts that a few weeks ago were reported as having little chance of a crop of any kind are now entertaining hopes of gathering in a normal yield. As a result of the outlook business has become very buoyant throughout the Prairie Provinces. This is one of the best signs of healthy crop conditions. Usually the merchants in the purely grain growing districts refuse to commit themselves to heavy purchases until the crop looks assured. They are buying now and jobbers are in consequence feeling the result.

VANCOUVER INDUSTRIAL ACTIVITIES.

ANNOUNCEMENT has just been made by Mr. D'Arcy Tate, vice-president of the Pacific Great Eastern Railway, that his company has now completed a deal whereby a block of 65 acres of the Lonsdale Estate, North Vancouver, becomes the southern terminus of the railway. The property is a part of District Lot 264 of the municipality of North Vancouver, opposite the First Narrows, and almost adjoins the Indian Reserve. On the property the principal freight and passenger terminals of the railway will be located in addition to wharves on the foreshore of Burrard Inlet, which is now held under lease by the new owners from the Dominion Government. Under the sale agreement the railway is bound to expend in development work $100,000 by December, 1915, and $400,000 by the end of 1918. Some idea of the railway's plans may be learned by the following clause in the agreement of sale: "The purchaser to erect, with all reasonable despatch, and to maintain for twenty years upon the northeast corner of district lot 264, its main passenger station for the north shore, and to establish for said period and to maintain on said lands the railway terminals, freight sheds, round houses, machine shops, railway yards and other railway facilities necessary and appropriate at such terminal; and also to maintain upon said lands (or on leasehold lands, i.e., the foreshore), wharves for the use of the coastwise and ocean shipping and to make and for the same period maintain on said lands the shipping terminals of the purchaser for Burrard Inlet, but nothing herein contained shall operate or bind the purchaser to own or operate vessels."

NEW METALIZING PROCESS.

INTERESTING experiments, says the Glasgow Herald, were conducted recently in Stewarts and Lloyds' warehouse, Glasgow, with the Ostermann apparatus for the metalizing of materials of all kinds. As is well known, metals can be galvanized by a variety of processes, all of which, however, have material disadvantages, either because of their limited scope or their high cost. During the experiments with the Ostermann apparatus it was shown that the plant was capable of coating homogeneously a variety of articles in metal, wood, glass, paper, and stone.

The process is simple and effective, and is claimed to be more economical than any known system of galvanizing. It consists of filling up completely and homogeneously the pores of the materials to be coated by what resembles a vapor, but which is really a fluid metal, such as zinc, lead, tin, aluminium, copper, bronze, nickel, or steel, or alloys of any of these. The coating is forced at high pressure from the nozzle of the machine in a thoroughly atomised state, with the result that when the fine atoms of liquid metal come in contact with the cold surface of the object to be coated (which is in its natural cold state), they immediately contract and a homogeneous amalgamation takes place so complete that when the piece of metal thus treated is bent, twisted, or hammered, it shows less trace of bursting and peeling than the original surface might have done.

It is claimed for the process that it can be used for an exceedingly wide variety of purposes, from the coating of ships' bottoms or other large steel structures to the metalizing of looking-glasses, or even of fine woven material such as that which is used in the making of aeroplanes and airships, and that this spraying system is much more effective and generally satisfactory than ordinary galvanizing.

Dundas, Ont.—The Dundas Water Commission will build a dam on Dundas St. Creek, costing $25,000. Contractors, McPhie, Kelly and Darling, Hamilton.

DEVELOPMENTS IN MACHINERY

A Record of New and Improved Machinery Tending Towards Higher Quality and Economical Production in the Machine Shop, Blacksmith Shop or Planing Mill.

MUMMERT-DIXON CRANE GRINDER.

THE Mummert-Dixon Crane Grinder is designed for grinding castings, and for handling pieces which are usually too heavy and large to grind in the ordinary way. It is virtually a grinding stand, combined with a power jib crane, the advantageous features of this combination being immediately apparent to anyone having castings to grind. In grinding castings which are too heavy to be lifted by hand, the crane supports them at the proper height and distance from the wheel. The operator needs only to swing them against and along the wheel, being unencumbered by any hard labor of hand lifting, and doing the work with greatest ease and rapidity.

MUMMERT—DIXON CRANE GRINDER.

The hoist is operated by power, and the raising and lowering is controlled by a lever conveniently located. The casting can be swung in any position horizontally, and suspended at any height vertically, making it possible, therefore, to go all over a casting in the least possible time. Provision is also made for operating the hoist by hand through a crank handle which slips on the end of the clutch shaft.

The hoist-trolley which is mounted on the jib is driven by a square shaft, which gets its drive through bevel gears from the clutch pulleys mounted on the shaft supported by a bracket attached to the frames. These clutch pulleys, one for hoisting and the other for lowering, are driven by belts from the countershaft at the back of the machine. The hand lever controls both clutches. Moving it in one direction engages the lifting clutch, and, in the other direction, the lowering clutch. The central position is neutral. The trolley follows in or out on the jib as the workman moves the casting. The swinging jib also follows with the casting.

The emery wheel stand is mounted at the front of the heavy base, and has a forward overhang, giving plenty of clearance in front and under the wheels. The arbor, which is of steel, runs in long self-oiling bearings. A detachable rest is provided, which may be used for lighter castings. The wheels are protected with substantial steel guards. On the back part of the base sets the two steel frames constructed of channels to which are fastened the brackets which support the swing arm of the jib crane. The countershaft, which runs in self-oiling bearings, is placed at the back, thus putting all belts out of the way.

The Mummert-Dixon Co., Hanover, Pa., are builders of this crane grinder.

KEYSEATER AND MILLING MACHINE.

OUR illustration shows a handy little machine put on the market recently by the Premier Machinery Co., Milwaukee, Wisconsin. It is adapted for slotting engine connecting rods, commutator slotting, slotting tubing, squaring up shaft rods, etc., and can be taken off main base and clamped on any shaft for keyway cutting by hand.

All parts are machined in jigs, all gears are housed, and no countershaft is necessary, the drive being direct from line shaft. The construction is rigid and powerful, and the spindle is driven by patent friction internal expanding

THE HERCULES MILLING MACHINE.

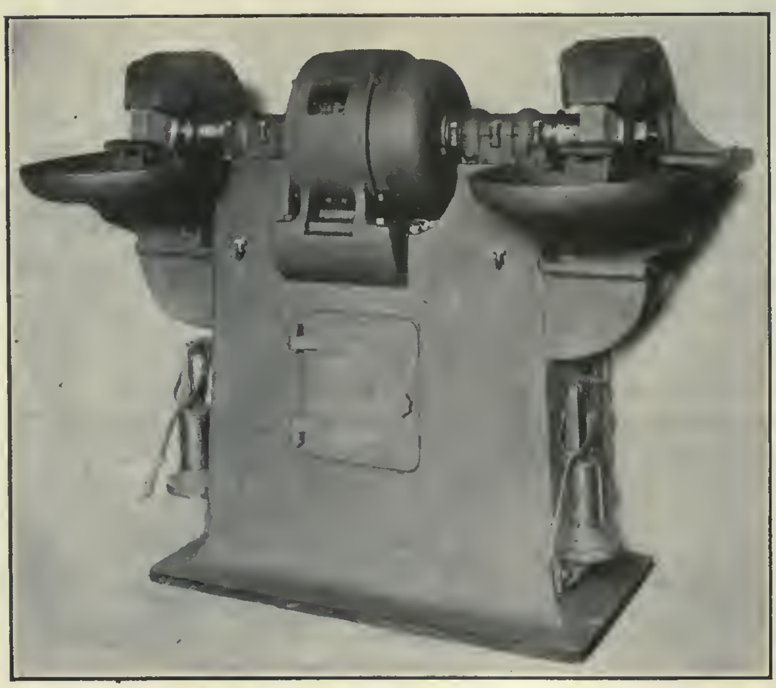
clutch. Power down feed and automatic trip, also power longitudinal feed 3 step cone, giving 3 changes of feed form features of this machine. The patent feed control prevents gouging of the cutter and affords absolute rigidity. The longitudinal travel of the table is 6 inches. Gears can be cut up to 20 in. diameter and 4 in. face, by means of an extra attachment. The net weight of the machine is 275 pounds complete.

MOTOR-DRIVEN DOUBLE WET GRINDER.

A NEWLY designed motor-driven double wet tool grinder has recently been placed on the market by the Bridgeport Safety Emery Wheel Co., Bridgeport, Conn., and is shown in the accompanying illustration.

The grinding wheels are supplied with water by means of hand operated air pumps, the water reservoirs being located in both ends of the base, extending from top to bottom of the frame. This method of maintaining the water level at proper height obviates the necessity of frequent filling. If at any time the emery wheels begin to run dry, a few strokes on the pumps will increase the air pressure on the head of the column, which will force the water up to a level of the grinder.

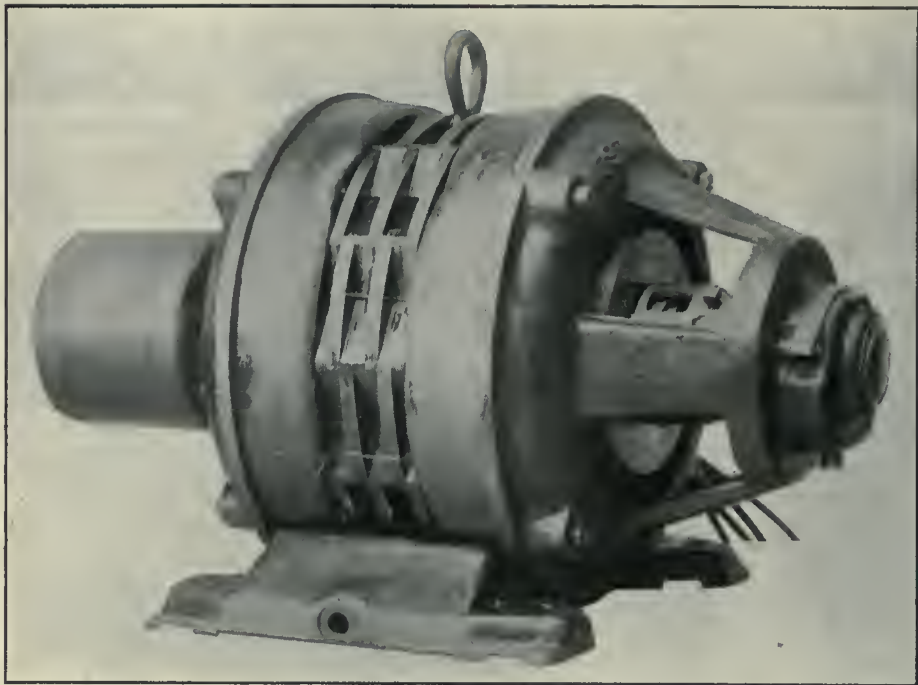
On this particular machine the bearings are $10\frac{1}{2}$ inches long. They are considerably longer than ordinarily required, but are employed for the reason that in this type of apparatus it is always necessary to have bearings both long and large because of the great leverage effect produced on the wheels by heavy grinding. The diameter of the spindle in the bearings and between flanges is $1\frac{3}{4}$ and $1\frac{1}{2}$ inches, respectively. The spindle is 52 inches in length, and carries two wheels, each 14 inches in diameter and 2 inches thick. The machine is driven by a $1\frac{1}{2}$ h.p. 1,200 r.p.m. Westinghouse series wound motor.



MOTOR DRIVEN DOUBLE WET GRINDER.

NEW WESTINGHOUSE SINGLE-PHASE MOTOR.

THE Westinghouse Electric & Mfg. Co. has placed on the market a new line of single-phase motors, made in capacities of from 2 to 10 horsepower, and suitable for the majority of constant speed applications within their capacities. The motor is of the repulsion-starting type, and when up to speed, runs as an induction motor. For most applications, it can be connected directly to the line, but where very low starting current is desired, a starting rheostat can be used.



NEW WESTINGHOUSE SINGLE PHASE MOTOR.

The frame is so designed that it combines great strength and radiating capacity with minimum weight and over-all dimensions. The laminations are riveted together under pressure, and pressed steel end plates are riveted to the unit thus formed. The foot, or base, is of pressed steel plate securely riveted to the end plates. This use of pressed steel marks an important step forward in the design of large single-phase motors. The bearings are large and dust-proof. The rotor coils are form-wound, and arranged to permit excellent ventilation. The commutator is of the radial type with undercut mica segments, and the shaft can be pressed out of the rotor without disturbing the windings or the commutator. Each motor can be arranged for operation on either 110 or 220 volt circuits.

Montreal, Que.—An order has been placed for 75 "Mikado" locomotives by the G.T.R, fifty of them to be used on the Canadian lines, the other 25 in the United States. The new locomotives will cost $26,000 each, so that the company will pay out $1,875,000 next year for motive power. Most of them will be built in the Montreal shops, and some in Philadelphia.

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Vol. X. JULY 31, 1913 No. 5

ENCOURAGING INDUSTRIAL OUTLOOK.

AFTER the first few very hot days of what afterwards develops into a very hot summer, we somehow get accustomed to prevailing conditions, and while we are disposed to pass all kinds of uncomplimentary remarks concerning a temperature of 90 or 95 degrees in the shade about the middle of May, a month later we take for the most part not even passing notice of equal and generally more continuously higher flights of the mercury.

It seems to us much the same condition of affairs with regard to business. The cry of tight money and the necessity, therefore, of industrial enterprises curtailing their output, came, not altogether with the suddenness of a burst of high temperature in May, but all the same with a somewhat similar effect. The fact that those in control of our purse strings bore a prominent part in spreading reports of an impending industrial depression, carried not a little weight in producing at least, a depressing effect, but strange to say, just as we are now sweltering day after day, unmurmuringly for the most part in what is after all a most welcome and enjoyable Canadian summer, we, likewise are now largely, if not altogether oblivious and forgetful of money stringency and business restriction.

From a list of firms engaged in machinery and general mechanical engineering product manufacturing, on whom our representative recently called, there has been secured unmistakable evidence, that for the most part, and this is a quite normal condition, these are working to capacity, and in some cases, work is actually being refused, on the latter account. In what are known as boom times throughout our land, every enterprise cannot lay claim to a share; so is it, meantime, there are industries which are not capacity favored, and there are units in like spheres with those enjoying the full cup, who, it may be, are simply holding their own.

We say again, therefore, that the general industrial outlook disposes to optimism, and why should it be otherwise? Our country's development is proceeding apace, its mineral and agricultural wealth is being both more systematically and quantitatively harvested, and top of all, there is no widespread and uncontrolled profligacy and recklessness manifesting itself in our public or private life. As we now take little notice of and pay the minimum of heed to the antics of Old Sol, and, get about our duties just the same, it will be just as well for us to let talk of industrial depression and tight money bear equally lightly, for by so doing, both we, individually, and the particular industry in which we fill a place and perform a necessary part, will benefit, and the era of prosperity be continued and extended.

VACATIONS.

VACATIONS are again in order, and just as surely as their season approaches, all of us are more or less ready to avail ourselves of the brief respite from business care and worry which they are intended to secure. It is, we think, not as fully realized as it might and should be, that a change of occupation and surroundings constitute in large part the conditions which go to make our annual holiday. An all-too-prevalent idea exists that we must get away to some more or less out-of-the-way place, back from the madding crowd and the din and rattle of machinery, and there compose ourselves and rest, the aim and intent being, of course, that we will be physically benefitted, and return to our duties with renewed vigor and earnestness.

The consummation of this ideal is, we are afraid, seldom achieved, unfortunately, and why? All of us are possessed of an innate sense of the necessity of a restful holiday, and most education imparted to us and thrust across our path has a like trend. Again, we are not altogether unanimous in our own mind as to what course should be adopted; and is it little wonder? Activity of the most exacting nature may be our daily portion for some 50 weeks of the year, and we find it hard to shut down altogether or even to any great extent for the remaining two weeks which we claim as our own. To say then, that under such circumstances, complete rest and quiet are what we need in the way of a tonic, is more or less ridiculous. The supposed very ideality of surroundings to secure these conditions, would open up opportunity of being more oppressed with our work than ever, due to our being, as it were, left entirely alone with ourselves and our thoughts.

Again, as has been already stated, we are not usually unanimous in our own mind concerning the nature and disposition of our holiday, because of a desire to substitute some pleasurable activity for the restful feature, and perchance the leaning in this direction carries most weight. If such be our desire, no parleying need take place as to the right course to adopt, for undoubtedly the greatest benefit physically and mentally will result from our yielding to the most powerful impulse.

It should be unnecessary to state that riot and license are, of course, excluded when determining our decision, or, for that matter, excess of any kind, and if the like care be exercised in protecting our physical and mental constitution when on holiday bent, as when pursuing our regular occupation, then no question will arise as to the recuperative effect of the holiday we were privileged to enjoy and that according to our own particular taste and inclination.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

	Per Ton.	
Foundry No. 1 and 2, f.o.b., Midland	$18 50	$18 00
Grey Forge, Pittsburg	....	14 65
Lake Superior, charcoal, Chicago	.....	16 25
	Mont'l.	Tor'to.
Canadian f'dry, No. 1..	$21 00	$20 00
Canadian f'dry, No. 2..	20 50	19 50
Middlesboro, No. 3....	20 75	21 50
Summerlee, No. 2	25 00	26 50
Carron, special	25 00	.....
Carron, soft	25 00	.....
Cleveland, No. 1	21 25	22 00
Clarence, No. 3	20 25	21 00
Jarrow	.....	23 50
Glengarnock	.....	26 00
Radnor, charcoal iron.	30 00	34 50
Ferro Nickel pig iron (Soo)	.....	25 00
Staveley, No. 1	21 75	22 50
„ No. 3	21 25	22 00

BILLETS.

	Per Gross Ton.
Bessemer billets, Pittsburgh ..	$26 50
Open hearth billets, Pittsburgh	26 50
Forging billets, Pittsburgh	34 00
Wire rods, Pittsburgh	29 00

FINISHED IRON AND STEEL.

Per pound to large buyers:

	Cents.
Common bar iron, f.o.b., Toronto..	2.10
Steel bars, f.o.b., Toronto........	2.20
Common bar iron, f.o.b., Montreal.	2.10
Steel bars, f.o.b., Montreal.......	2.20
Bessemer rails, heavy, at mill....	1.25
Iron bars, Pittsburgh	1.55
Steel bars, Pittsburgh, future	1.40
Tank plates, Pittsburgh, future...	1.45
Beams, Pittsburgh, future	1.45
Angles, Pittsburgh, future	1.45
Steel hoops, Pittsburgh	1.60

Toronto Warehouse f.o.b., Toronto.

	Cents.
Steel bars	2.35
Small shapes	2.40

Warehouse import, freight and duty to pay:

	Cents
Steel bars	1.80
Structural shapes	1.85
Plates	1.85

Freight, Pittsburgh to Toronto:

18 cents carload; 21 cents less carload.

BOILER PLATES.

		Mont'l.	Tor'to.
Plates, ¼ to ½-in., 100 lbs.		$2.35	$2.35
Heads, per 100 lbs.........		2.65	2.95
Tank plates, 3-16 in.		2.60	2.60
Tubes, per 100 ft.,	1 inch	9.00	8.50
" "	1¼ in.	9.00	8.50
" "	1½ "	9.00	9.00
" "	1¾ "	9.00	9.00
" "	2 "	8.75	8.75
" "	2½ "	11.50	11.50
" "	3 "	12.00	12.00
" "	3¼ "	13.75	13.75
" "	3½ "	14.50	14.50
" "	4 "	18.00	18.00

BOLTS, NUTS AND SCREWS.

	Per cent.
Stove bolts	80 & 7½
Machine bolts, ⅜ and less	65 & 5
Machine bolts, 7-16.......	57½
Blank bolts	57½
Bolt ends	57½
Machine screws, iron, brass	35 p c.
Nuts, square, all sizes.....	4c per lb off
Nuts, Hexagon, all sizes..	4¼ per lb off
Flat and round head.....	35 per cent.
Fillister head	25 per cent.
Iron rivets	60, 10, -0 off
Wood screws, flathead, bright	85, 10 p c off
Wood screws, flathead, brass	75, 10 p c off
Wood screws, flathead bronze	70, 10 p c off

National-Acme "Milled Products."

Sq. & Hex Head Cap Screws	65 & 10%
Sq. & Hex Head Cay Screws	65 & 10%
Rd. & Fil. Head Cap Screws	45-10-10%
Flat & But. Head Cap Screws	40-10-10%
Finished Nuts up to 1 in. ..	75%
Finished Nuts over 1 in. ..	72%
Semi-Fin. Nuts, up to 1 in...	75%
Semi-Fin. Nuts over 1 in.....	72%
Studs....	65%

Discounts f.o.b., Montreal.

WROUGHT IRON PIPE.

The following are Toronto jobbers' discounts on pipe in effect from April 21, 1913:

Standard	Buttweld Black	Buttweld Gal.	Lapweld Black	Lapweld Gal.
¼ ⅜ in.	62	47	....	....
½ in.	68	58	....	....
¾ to 1½	71½	61½	68½	58½
2 in.	71½	61½	68½	58½
2½ to 4 in. ..	71½	61½	70½	60½
4½ to 6 in. ..	....	....	71½	61½
7. 8, 10 in. ..	....	....	66	54

X Strong P. E.

¼, ⅜, ½in. ..	56½	46½	....	....
¾ to 1½ in. ..	67½	57½	....	....
2 to 3 in.	68½	58½	....	....
2½ to 4 in. ..	....	....	65	55
4½ to 6 in.	....	....	64	56
7 to 8 in.	....	....	55	45

XX Strong P. E.

½ to 2 in.	43	33	....	....
2½ to 4 in.	....	....	43	33

PRICES OF WROUGHT IRON PIPE.

Standard. Nom. Diam.	Standard. Price. per ft.	Extra Strong. Sizes Ins.	Extra Strong. Price per ft.	D. Ex. Strong. Size Ins.	D. Ex. Strong. Price per ft.
⅛in	$ .05½	⅛in	$ .12	½	$ .32
¼in	.06	¼in	.07½	¾	.35
⅜in	.06	⅜in	.07½	1	.37
½in	.08½	½in	.11	1¼	.52½
¾in	.11½	¾in	.15	1½	.65
1 in	.17½	1 in	.22	2	.91
1¼in	.23½	1¼in	.30	2½	1.37
1½in	.27½	1½in	.36½	3	1.86
2 in	.37	2 in	.50½	3½	2.30
2½in	.58½	2½in	.77	4	2.76
3 in	.76½	3 in	1.03	4½	3.26
3½in	.92	3½in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4½in	1.27	4½in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.86	...	.....
7 in	2.38	7 in	3.81	...	.....
8 in	2.50	8 in	4.34	...	.....
8 in	2.88	9 in	4.90	...	.....
9 in	3.45	10 in	5.48	...	.....
10 in	3.20	....	....	...	.....
10 in	3.50	....	....	...	.....
10 in	4.12	....	....	...	.....

IRON PIPE FITTINGS.

Canadian malleable, 40 per cent.; cast iron, 65; standard bushings, 70; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 75; malleable, lipped unions, 65.

COKE AND COAL.

Solvay Foundry Coke	5.95
Connellsville Foundry Coke	5.45
Yough, Steam Lump Coal	3.93
Penn. Steam Lump Coal	3.63
Best Slack	2.95

All net ton f.o.b. Toronto.

OLD MATERIAL.

	Mont'l.	Tor'to.
Copper, light	$10 50	$11 50
Copper, crucible	13 00	14 50
Copper, uncr'bled, heavy	12 00	12 50
Copper wire, uncrc'bled	12 00	12 50
No. 1 machine compos'n	10 50	11 50
No. 1 comps'n turnings	9 50	9 50
No. 1 wrought iron	.....	9 00
Heavy melting steel	.....	8 00
No. 1 machinery cast iron	.....	14 00
New brass clippings	8 50	8 50
No. 1 brass turnings	7 25	7 80
Heavy Lead	3 25	3 90
Tea lead	2 50	2 50
Scrap zinc	3 25	3 50

Dealers' purchasing prices.

METALS.

	Mont'l.	Tor'to.
Lake copper	14.50	15.75
Electrolytic copper	14.50	15.75
Spelter	6.00	5.35
Lead	5.25	5.10
Tin	43.75	40.00
Antimony	10.00	9.25
Aluminum	21.00	18.00

SMOOTH STEEL WIRE.

No. 6-9 gauge, $2.35 base; No. 10 gauge, 6c extra; No. 11 gauge, 12 extra; No. 12 gauge, 20c extra; No. 13 gauge, 30c extra; No. 14 gauge, 40c extra; No. 15 gauge, 55c extra; No. 16 gauge, 70c extra. Add 60c for coppering and $2 for tinning.

Extra net per 100 lb.—Spring wire; bright soft drawn, 15c; charcoal (extra quality), $1.25.

SHEETS.

	Mont'l.	Tor'to.
Sheets, black, No. 28	$2 85	$3 00
Canada plates, ordinary, 52 sheets	2 80	3 00
Canada plates, all bright.	3 70	4 15
Apollo brand, 10¾ oz. (American)	4 30	4 20
Queen's Head, 28 B.W.G.	4 50	....
Fleur-de-Lis, 28 B.W.G.	4 20	....
Gorbal's Best Best, No. 28	4 45	....
Viking Metal, No. 28	4 40	....

NAILS AND SPIKES.

Standard steel wire nails, base	....	$2 40
Cut nails	$2 60	2 65
Miscellaneous wire nails	75 per cent.	
Pressed spikes, ⅝ diam., 100 lbs.	....	2 85

FINE STEEL WIRE.

Discount 25 per cent. List of extras. In 100-lb. lots: No. 17, $5; No. 18, $5.50; No. 19, $6; No. 20, $6.65; No. 21, $7; No. 22, $7.30; No. 23, $7.65; No. 24, $8; No. 25, $9; No. 26, $9.50; No. 27, $10; No. 28, $11; No. 29, $12; No. 30, $13; No. 31, $14; No. 32, $15; No. 33, $16; No. 34, $17. Extras net. Tinned wire, Nos. 17-25, $2; Nos. 26-31, $4; Nos. 30-34, $6. Coppered, 75c; oiling, 10c.

MISCELLANEOUS.

	Cents
Putty, 100 lb drums	$2.70
Red dry lead, 560 lb. casks, per cwt.	6.00
Glue, French medal, per lb	0.10
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.26
Benzine, per gal.	23½
Pure turpentine	0.60
Linseed oil, raw	0.60
Linseed oil, boiled	0.63
Plaster of Paris, per bbl.	2.10
Plumbers' Oakum, per 100 lbs.	3.25
Pure Manila rope	17

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents.

Toronto, July 29, 1913.—The market for general mechanical engineering material continues quiet, with price changes within narrow limits. Business in finished iron and steel from warehouse has been very good during the last two weeks, the demand for boiler tubes, sheets, bars, etc., having started again. It was reported locally this week that the National Wire Co., of Montreal, will be a factor in the Canadian market within the next two weeks. This is a new concern which formerly went under the name of the Canada Wire Co. A prominent Montreal wire rope company has written to say that business this year, as compared with the last two years, is practically the same. The demand seems to be from about the same quarters, and from what they can see ahead, they feel that for several years yet they are going to have an equally good time, particularly in this particular line.

Metals.

Tin has fluctuated between 38 cents and 41 cents, a condition brought about largely by manipulation, as sales have been both small and infrequent. The market for copper seems to be getting better every week. Recently the price took another drop, but since then it has been slowly rising, and to-day is quoted at $15.75. Local trade is fairly active, and dealers and manufacturers expect the price of copper to further increase. During the recent disturbance copper wire has been the market's salvation. There has been quite a demand for this commodity, especially for electrical work. The price of aluminum is down to $18, which is a considerable decrease on last week's price. This is due to decreased consumption, the supply at present being much greater than the demand. The market for old metal is fairly active, principally in copper wire and white metals.

St. John, N.B., July 26, 1913.—The common council has voted to erect an incinerating plant in the city at a cost of approximately $50,000. No tenders have as yet been authorized, but a site has been chosen, and it is planned to make a start as soon as the money market shows an easier tendency. The plant of the Partington Pulp and Paper Co., Ltd., has been entirely renovated, and the general overhauling to which it was subjected has been responsible for an increased production of bleached sulphite. The expectation is that if the money market shows an improvement soon four machines for the manufacture of special grades of paper will be installed. A spur line from the mill to the C. P. R. tracks is being constructed, thus doing away with the expense of supporting motor trucks which were formerly in use. Various industries are being hampered somewhat by the strike amongst the lumber mill workers, which has continued for more than a month now, and it is thought that strong pressure will be brought to bear to have the trouble ended. The various lime kilns which have been in operation near the city have been compelled to close for lack of fuel, and lime is being imported from Upper Canada and the States. Different wood-working factories are running short on material, and shipping has been much retarded. There has been no attempt made by either owners of workmen to discontinue the strike, which has been general, and the following large plants are affected: Two mills owned by the Stetson, Cutler Co., Ltd.; one by John E. Moore, Charles Miller, Hilyard Bros., Miller Bros., F. E. Sayre, Murray & Gregory, Randolph & Baker, and Warner & Co. The dispute concerns wages, and about 1,600 men have been out of work for a considerable time, although the majority of them are now employed in other lines of labor. In other parts of the province lumbering is going on full blast, but the season has been disastrous so far as St. John is concerned. A notable departure has been made in the policy of the Maritime Nail Co., Ltd., of St. John, in that they have purchased the plant of a rod mill company at Voelblingen, Germany, for the purpose of supplying their Canadian nail works with rods. Stanley Elkin returned a few days ago from Europe, and was present when the first shipment of 4,000 tons was made to St. John, the largest cargo of its kind ever brought to Canada. Mr. Elkin said he found the mill, which was formerly in the German Steel Trust, in excellent working order, and by their establishment of these works in Germany the Maritime Nail Co. will effect a great saving in cost of operating, and be able to put their mills in an advanced position in the competitive field. Mr. Elkin interested several German manufacturers in the scheme, and on the board of directors are: A. Roechling, president of the Stahl Works, Berhard; W. Mosher, director of the Deutsche Wire Rod Syndicate, and Norton Griffiths, M.P. The capacity of the German mills is 40,000 tons a year, and their being acquired by the local company is a strong step forward. John Kenny, factory inspector, returned this week after a trip of inspection throughout the North Shore and eastern end of the province, and reported that conditions in each of these places were most encouraging from a business viewpoint. Heavy shipments were being made from the various plants, and the only dark spot was at Sackville, where about 400 moulders had been on strike. It was expected that the strike would soon be settled, however. It was announced this week that the C. P. R. would instal ten new tracks in West St. John in connection with their new million dollar elevator, on which extensive operations are now in progress. It is expected that the new elevator, which will not interfere in any way with the work at the old plant, will be completed and in operation by December 1. A. K. Beauvais, foreman with the Dominion Bridge Co., arrived in the city yesterday to attend to the supervision of the steel work in connection with the superstructure of the Atlantic Sugar Refineries, Ltd., at the Ballast Wharf. Bases for the heavy steel columns were placed in position this week, and the expectation is that the actual steel construction work will begin the first of next week.

QUEBEC BRIDGE PROGRESSING.

THE sub-structure on the north side of the Quebec bridge will be completed in about a month's time, and there is only about twelve and a half per cent. of the entire contract, embracing both the Quebec and Levis sides, remaining to be executed. This information was given out by Mr. J. T. Davis, of the contracting firm of M. P. and J. T. Davis, who were awarded the contract the other day for the big dry dock on the Levis side of the river.

In speaking of this undertaking, which the firm are to have completed in three years, Mr. Davis said that within a week of the signing of the contract, the work will be started. A good deal of the work can be carried on in winter. Speaking of the Transcontinental contract yet in the hands of the firm, east of Chaudiere, Mr. Davis said that their representative, Mr. William Daly, is pushing along the work, which he thought would be complete some time in October.

TENDERS FOR N.T.R. QUEBEC SHOPS.

AT a recent meeting of the Quebec city council, the clerk read the following letter from Mr. Leonard, of the National Transcontinental Railway:

Ottawa, July 3, 1913.

His Worship, Mayor Drouin, Quebec, P. Q.

"Dear Mayor Drouin, I beg to acknowledge receipt of your letter of the 27th June, and in reply would call your attention to the official letter sent you by this Commission on June 6th, which was delivered to you on June 11th by Mr. Fraser, and which I note, was read at a meeting of your council on June 13th.

"Work was commenced on June 27th draining the St. Malo site for the proposed shops ,and is being carried on at present. Final details preparatory to calling for tenders for the construction of the shops are now under way, and these tenders will be advertised for probably within a couple of weeks.

"As a preliminary to the rearrangement of the yard at the Palais Station, and the construction of the new Union Station on that site, you will probably have noticed that the C.P.R. is laying a number of new sidings just west of the proposed lay-out, which will be necessary for use during the carrying out of the work.

"The agreement as between the city council and this Commission governing these matters, is being prepared.

"Trusting this will give you the desired information, I remain, yours very truly,

R. W. LEONARD."

Mayor Drouin informed the council that since the reception of this letter, Mr. Fraser, the engineer of the Transcontinental, had submitted the contract of their Quebec works to him, and the contract had been submitted to the city attorneys, who had sent it to Ottawa. He expected that the contract would be sent to him in a few days for his signature. Mr. Doucet, the company's engineer, had informed him that the specifications would be ready in a few days, and he had received instructions to call for tenders for the workshops as soon as the plans and specifications were ready, and the contract signed between the city and the National Transcontinental Commission.

CANADA'S TRADE.

CANADA'S total trade for 12 months ending April, 1913, as published in a bulletin by the Department of Trade and Commerce, and summarized by The Globe correspondent, was $1,079,934,018, a splendid increase compared with the like period preceding, when the total was $879,611,838. The total imports were $678,587,617. Exports were $401,346,401. The amount of duty collected was $115,641,977.

One of the most interesting items in the list of imports is settlers' effects brought in by immigrants. During the twelve months ending April 30 this year the value of these from the United States $10,296,265, as compared with $4,900,274 from Great Britain.

Imports From United States.

The figures show in a comprehensive way the striking increases in the imports and exports which have already been reflected in monthly reports. A noteworthy feature is the increase of imports from the United States. Imports from that country during the twelve months were valued at $442,213,343, an increase over the preceding period of over seventy-five million, or about 18 per cent., and of more than 100 per cent. over the twelve months which ended April 30th, 1910. The total British imports for the year ending with April, 1913, also showed a satisfactory increase, being $140,177,842, nearly twenty-two millions, or 17 per cent. increase over the preceding period.

Increase Also in Exports.

Exports also show a satisfactory increase in the report. For the twelve months to the end of April, 1913, the total was $401,340,401. For the corresponding period of the previous year it was $318,919,890. For 1913 the exports to the United Kingdom were $183,734,8?0. To the United States they were $168,605,800.

Victoria, B.C.—The Steveston branch of the Canadian Northern Railway, which is now almost completed, will probably be operated by gas-electric locomotives.

IT would be idle, at the present time, to deny that money is not circulating as freely as it has been for the past four or five years.

¶ Money has undeniably been tighter than usual and no one seems to have been able to put a finger on the cause and define it. Some attributed it to the trouble in the Balkans and uneasiness concerning the outcome, while others say the present stringency arises from a general and quite natural slowing up: that there is no specific reason for it, and that the condition will disappear as it came—gradually.

¶ There is a strong feeling of confidence among leading business men and trade continues normally good with the more aggressive houses—abnormally good with some.

¶ Optimism is gaining ground and will ripen with the crops. In authoritative circles the impression prevails that the present stringency is passing and that the silver lining is in sight.

¶ Speaking in Ottawa, on July 26th, the Rt. Hon. Thomas Lough, representing the Empire Parliamentary visitors, said of Canada's financial outlook that: "The great natural resources of the Dominion are her greatest asset, and this year the logs will come down the rivers, and the grain in ships down the waterways and on the railways and her prosperity this year will be greater than ever." Mr. Lough considered that the present trip of the party will result in a great influx of English capital in the future.

¶ Business, as we have already remarked, continues strong with many manufacturers. One of the leading makers of Power Plant Equipment said last week that he had sufficient business booked and in sight to keep his plant going night and day for five or six months.

¶ Another manufacturer in a similar line of business was in much the same situation, and both predicted a speedy dissipation of the tight money cloud.

¶ The manager of one of the largest machinery manufacturing houses in Canada said to us the other day: "Money is a little tight, to be sure, but we are confident that it is only a temporary cloud and will soon disappear. *We are going after business a little harder; our salesmen are raking the country more aggressively, and we are helping them by increasing our advertising.* As a result business is coming in even greater volume than at this period last year and we are decidedly optimistic about the future."

¶ Get those words in italics, read them again, because they voice the secret of business success in tight-money-time, hot-weather time or any old time.

¶ Aggressive management, aggressive salesmen, and aggressive advertising, and back of it all, the spirit of optimism, and you have a combination that will win every time and all the time, and beat any tight money bogie that ever happened.

¶ Go after business hard from now on. Encourage and enthuse your salesmen. *Advertise freely and make your message cheerful.* An investment in good, sound advertising will not only help you wonderfully in getting business now, but it will come back, heaped up and running over, when money circulates with its old-time freedom.

¶ The future is bright, and if everybody will spread the spirit of optimism, everything will be rosy in a very short time. The best way to inspire confidence is to preach it.

¶ Loose talk about tight money is largely the cause of it.

Canadian Machinery & Manufacturing News

Canada's only Machinery and Metal Working Paper.
A weekly publication that thoroughly covers its Field.

143 University Avenue, TORONTO

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Engineering

Guelph, Ont.—Operations have begun at the Malleable Iron Works. About 120 men are already at work. So far one or two heats in malleable iron have been run off.

Hamilton, Ont.—John R. Nye, of Chicago, is proposing to organize a company to manufacture machinery for making artificial gas for heating and lighting purposes.

Orillia, Ont.—A fire occurred on July 26 at the old foundry of the E. Long Manufacturing Co. The pattern house and large storage shops and wooden buildings were destroyed.

Toronto, Ont.—Because of the tariff restrictions which, they claim, almost prohibit the exportation of electrical heating apparatus from the United States to Canada, the Hot Point Electric Heating Co., which now has its central plant at Ontario, Cal., will immediately build a large branch manufacturing plant at Toronto. Announcement to this effect was made on July 25, by Willis Booth, president of the company. The Canadian plant of the Hot Point Electrical Heating Co. will cost $250,000, and employ between 150 and 200 persons.

Sydney, N.S.—The Sydney Foundry and Machine Works, Ltd., recently installed punch and shears, electric traveling crane, electric forges, structural steel saw and a large air compressor.

Welland, Ont.—The directors of the Supreme Heating Company met last week, and decided to make extensive additions and improvements this fall to cost in the neighborhood of $10,000. The moulding department will be enlarged, and a new warehouse erected. At present about thirty hands are employed, and this staff will be doubled. Eight stoves are turned out daily and as this is below the demand the directors felt that an early start on the additions contemplated would be advisable.

St. Thomas, Ont.—The people will be asked to pass upon a by-law to establish a motor truck factory in the city. The findings of the special committee, who went to Findlay, Ohio, to investigate the conditions governing the property of Mr. Ewing, were of a satisfactory character, and a recommendation followed by the committee that the question of guaranteeing the bonds of the proposed company to the extent of $125,000 be given the ratepayers. The building to be put up in St. Thomas will cost $50,000, the land probably $5,000, and, with the capital subscribed by local parties to the extent of $50,000, the machinery and raw material will make up the difference. The factory will employ 300 skilled men at the end of six months, with wages ranging from 25 to 60 cents an hour. The industry will be equipped to manufacture parts of auto machinery, as well as the making of trucks.

Toronto, Ont.—Cluff Brothers, the plumbing supplies' firm, recently completed the purchase of the premises owned and formerly used by the General Brass Co. on Sterling Road, near the C. P. R. tracks, in the north-west of the city, for $50,000. A new company is being formed to be known as the Cluff Manufacturing Co. who will manufacture plumbing supplies, and the newly-bought factory will be occupied by them. The General Brass Co. ceased operations two years ago, but held their charter, and several assets, among which the Sterling Road property was one. They sold part of their machinery some time ago. The site in question has a frontage of 205 feet on Sterling Road, and is 185 feet deep. About 60 feet of its width is vacant of

PROBABLE EQUIPMENT REQUIREMENTS

The undernoted firms are now, or likely to be soon in the market for new equipment, etc. For fuller details, reference should be made to the news items:

Cast Iron Pipe.

City Commissioners, Vancouver, B.C.

Incinerator.

Corporation of Point Grey, Kerrisdale, B.C.

Foundry Supplies.

Malleable Iron Works, Guelph, Ont.

E. Long Mfg. Co., Orillia, Ont.

Imperial Steel and Iron Co., Prince Albert ,Sask.

Supreme Heating Co., Welland, Ont.

Generators.

Grenfell ,Sask.

Kaministiquia Power Co., Fort William, Ont.

Electrical Supplies.

Hot Point Electric Heating Co., Ontario, Col.

Grenfell, Sask.

Weston Water and Power Commission.

New Toronto, Ont.

Woodworking Machinery.

Hymers Bros., Hymers, Ont.

Lawrie Wagon & Carriage Co., Winnipeg.

L. Macheau, Montreal.

Transformers.

Medicine Hat, Alta.

Machine Tools.

Hot Point Electric Heating Co., Ontario, Cal .

Supreme Heating Co., Welland, Ont.

Benedict-Proctor Co., Toronto.

Lawrie Wagon & Carriage Co., Winnipeg.

Lavoie & Lavoie, 789 Berri St., Montreal.

Waterworks Supplies.

Hull, Que.

Halifax, N.S.

Edmonton, Alta.

Refrigerating Machinery.

City Commissioners, Calgary.

H. C. Hocken, Mayor of Toronto.

buildings. At present the new owners will only use the building which now occupies the ground, but they expect to expand their factory later.

Electrical

Medicine Hat, Alta.—City Engineer Grimmer has been authorized to place an order for six 500-kilowatt transformers. A total voltage of 13,000 will be installed.

Grenfell, Sask.—The citizens have adopted a by-law to raise $15,000 for installing a civic electric plant. The contract has been let and it is hoped to have the plant in operation by Oct. 1.

Galt, Ont.—On the suggestion of Dr. W. S. Dakin, Chairman of the local Hydro-electric Commission, the City Council will consider the purchase of a pulmotor the cost to be shared by the town and the Hydro Commission.

Regina, Sask.—The experimental station at Estevan which is being established by the Provincial Government will be finished in August, and it will then be possible to complete the investigation into the power-producing possibilities of Estevan coal.

Weston, Ont.—Weston Water and Power Commission have planned to make considerable extensions outside the town. Etobicoke and York townships are the territory in question. A. G. Pierson, secretary of the Commission, has prepared an estimate, and the probable cost will be $13,000. About 400 poles and 10 miles of wire will be necessary. The extension in York will be made to Downsview.

Hydro-Electric Power.—Cannington, Beaverton, and other municipalities in this district will have Hydro power in their factories soon. The Provincial Commission has awarded the switching and transformer equipment contract to the Westinghouse Co., and the contract for supplying generators to the European house of the Kilmer-Pullen Co. The power will be obtained from Wasdell Falls, North Orillia township, Simcoe County, and Galbraith & Co., of Montreal, are constructing the necessary dam.

Newcastle, N.B.—Newcastle is to be the Atlantic terminus of the Universal Radio Syndicate, which will establish a wireless service from Britain to this town as a link in an all-British world encircling service. A Montreal concern has contracted to build and instal the plant. The steel tower will be 500 feet high. It is being constructed in England and will be shipped out in sections. Round this central tower will be grouped six other towers, each one hundred feet high, connected by copper wire with the central tower. The president of the syndicate is A. Baxendale, consulting engineer; and Dr. Erskine Murray, Glasgow, Scotland, with Dr. Poulsen and Prof. Peterson, technical directors.

Welland, Ont.—A new transformer house for the Hydro-Electric will be erected on Queen Street. This is required for the increased load used by the Canada Forge Works. It will be fed direct from the new line from Niagara Falls and will be in operation before the snow flies. The new line from Niagara Falls direct to Welland is now being built and a primary line is being built to Turnbull's brick yard, where electricity is being installed instead of gas, and the machinery will be operated by electric power. The brick will also be dried by electricity.

Negotiations are now on for a contract for 6,000 horse-power for the new electric smelter to be erected on the site of the brick yard.

Wood-Working

Fort William, Ont.—Hymers Bros.' sawmill at Hymers, Ont., was burned to the ground on July 23, with 30,000 feet of choice lumber. The loss at the mill alone was $30,000, and there was no insurance.

Building Notes

Toronto, Ont.—A permit has been issued to J. G. Discon for an apartment house at St. Clair and Glenbro Avenues to cost $11,000.

Toronto, Ont.—A permit has been issued to Sproat & Rolph, architects (in trust) for a five-storey brick building at Richmond and Peter Streets to cost $50,000.

Municipal

Port Coquitlam, B.C.—The city will spend $10,000 for fire apparatus.

Rivers, Man.—The town is spending $8,000 for additional fire protection.

Quebec, Que.—Four motor tractors for the Quebec Fire Brigade arrived at the end of last week.

Orillia, Ont.—A by-law to authorize a loan of $25,000 to the C.N.W. Shoe Co., was carried on July 21. The company will begin to build at once, and hope to be ready for business by October 1.

Hull, Que.—Debentures to raise the amount of $77,700 for the extension of the waterworks system through suburban districts of Hull, have been issued by the Hull city council. The work will commence shortly.

Toronto, Ont.—According to the proposition submitted last week to the members of the city council by the Bell Filtration Co., through Mr. H. W. Cowan, its chief engineer, the company undertakes to build a mechanical filtration plant on the mainland adjoining the main pumping station at the foot of John Street. The Bell plant, manufactured in Manchester, England, would have a minimum capacity of 65,000,000 gallons and a maximum of 96,000,000.

The Bell proposition contemplates that the present $800,000 plant be retained for use as a basin to effect settlement of the water before filtration.

Tenders

Brighton, Ont.—Tenders will be received by B. H. Mahoney, Guelph, for the construction of a factory, owner's name of which has not been revealed.

Vancouver, B.C.—Tenders for the supply of 3,750 feet of 18-inch cast iron flexible pipe for the False Creek submerged main will be called for shortly by the City Commissioners.

Contracts Awarded

Ottawa, Ont.—The contract for the new postal station "G" for Toronto was let by the Government on July 17. The building will be erected at Queen and Saulter Streets, and will cost $126,214. Witchall & Son are the builders. Other Ontario contracts awarded were: Public building at Preston, to Geo. E. Proctor, at a price of $44,861. Public building at Shelburne. The contractors are Alex. Greer and W. A. Campbell, and the cost will be $39,707. Public building at Elmira. The contract goes to E. A. Bleakney, and the cost is to be $35,000. Dredging at Killarney. The contractor is the C. S. Boone Dredging Company, and the amount of the work is $8,000.

Water Works

Halifax, N.S.—The city is borrowing $300,000, among other things for sewer construction, costing $152,500, and extension of water system, costing $50,000.

New Liskeard, Ont.—The waterworks, for which tenders were called, will not

be erected until debentures are sold. The tenders were thrown out, and the cheques returned.

Edmonton, Alta.—By-laws to authorize debentures for municipal expenditures of \$2,340,400 have passed their final reading. These include \$519,760 for waterworks, and \$1,692,149 for sewer extensions.

Toronto, Ont.—Allen Hazen, of Hazen & Whipple, New York, will probably design the city's new million-dollar mechanical water filtration plant to be constructed on Toronto Island. Toronto cannot engage anyone else if it wants to, according to an agreement entered into with Mr. Hazen on August 8, 1912, when the municipality agreed with Mr. Hazen that he should be retained to give expert advice in connection with the construction of future extensions of the filtration plant. Mr. Hazen has written to the city reminding them of the agreement and intimating that he expects to have charge of the plans for the new plant the City Council voted recently to construct.

Railways—Bridges

Camrose, Alta.—It is the intention of the C. N. R. to lay steel on the C. N. R. grade, south-west of Camrose.

Welland, Ont.—The new branch of the N. S. & T. Railway, from St. Catharines to Niagara-on-the-Lake, will be opened about October 1st.

Toronto, Ont.—The C. P. R. will immediately commence operations for the construction of an electrical road from Hamilton to Niagara Falls.

Nelson, B.C.—On July 29th the ratepayers voted on a by-law to authorize the corporation to guarantee the payment of \$40,000, being a mortgage debenture issued by the Nelson Street Railway Co., Ltd.

Toronto, Ont.—According to the plans now prepared by Assistant City Engineer Powell, the city will expend \$3,000,000 next year in bridges. The Bloor Street viaduct is the chief work planned and will consume a large amount of the sum named. The Gerrard Street bridge, the C. P. R. viaduct, Poplar Plains Road, Avenue Road and other bridges of less importance, make up the balance.

The Tool Steel Feature From a Salesman's Point of View*

By G. M. Bigger **

The advances made in the quality production of tool steel have contributed almost wholly to bring about the present magnificent high grade machine equipment found in both large and small mechanical engineering plants, and no more interesting profitable and fascinating study than this unique feature can engage the attention of mechanics and those responsible for the output of our workshop.

WITH the highest grade tool steel manufacturer, only three general classifications are usually recognized, under present condition. There are what are known as the water-hardening carbon steels, alloy steels, and high speed steels. The processes and methods of tool steel manufacturers have wholly changed within the past ten or twelve years. In addition to the usual grades and tempers of carbon steels, numerous alloy steels, such as nickel steel, nickel-chrome steel, nickel-vanadium steel, chrome steel, chrome-vanadium steel, vanadium steels, tungsten and tungsten-vanadium steels, are made to meet countless conditions and requirements.

Water-Hardening Carbon Steels.

Let us first refer in our discussion to what are generally known as the water-hardening carbon steels. In 1908, a Board on Tool Steel, appointed by the U.S. Navy Department to investigate the quality, shape, size and brands of tool steels to be used in the Navy Department, reported these requirements:

"That first in importance of the desirable qualities tool steel should have, is that it shall be of uniform quality throughout for each and every grade.

"That it shall be of such chemical composition that it is not likely to fire crack in hardening, under proper conditions.

"That this chemical composition should be such as to render it as little liable as possible to be ruined through carelessness in forging the tools, or in subsequent grinding, and that the tools shall be as strong as practicable in the body.

"That the composition permit of forging it through a comparatively wide range of temperatures; and finally, the steel should be free from seams, cracks and other surface imperfections."

When one reads these requirements he is impressed with the precautions that the manufacturer must take to make his steel "fool proof."

It will be found by examining the catalogues and products of nearly all the American manufacturers of crucible tool steels that the carbon steels generally group themselves into three classes:— First a grade that sells at about 7 cents per pound base; second, a grade that sells at about 12 cents per pound base, and, third, a grade that sells at about 18 cents per pound base. Each of these grades is made to meet a certain class of trade, and it will be found that all the manufacturers are well equipped to yield a product of high standard in each class. As we all know, each of these grades are made in various tempers; that is, they contain varying percentages of carbon to suit the different conditions of service, and the heat of forging, annealing or hardening, and the temperature to which the temper is drawn after hardening is regulated by the amount of carbon they contain. In general, steels containing a lower percentage of carbon require a higher heat in each operation than those containing higher percentages of this element.

Temper and Quality Features.

It may be well to state here that quality and temper of steels are two very different things. The temper of steel does not constitute its quality. The different grades and qualities of steel are made in the same temper, and the price is regulated by the quality. Quality in this sense is determined by the grades of material used in the manufacture of the steel, while temper means the carbon contained in the steel. I wish to call attention to the fact that the word temper in this sense must not be confused with the same word used in relation to drawing a hardened piece of steel. In drawing, we say, draw to a light straw temper, a dark straw temper, a dark blue temper ,a light blue temper, a black temper as the case may be. In these connections, the word temper has no relation whatever to the carbon contained in the steel. A great many times I have heard men say they wanted " a high carbon steel," when in reality they wanted only a high grade of carbon steel. You can get the same amount of carbon in each of the grades mentioned.

Carbon Steel Tempers.

In carbon steels the manufactuver usually runs his tempers in six classes:— First, steels containing from 0.70 to 0.80 per cent. carbon; second, steels containing from 0.81 to 0.91 per cent. carbon; third, steels containing from 0.91 to 1.00 per cent. carbon; fourth, steels containing from 1.01 to 1.10 per cent. carbon; fifth, steels containing from 1.11 to 1.20 per cent. carbon, and sixth, steels containing from 1.21 to 1.30 per cent. carbon. These various tempers are used in the different grades for about the following purposes:

In the 7 cent grades, steels containing from 0.70 to 0.80 per cent. carbon are used for such work as anvil facings, pinch bars, blacksmith's tools, drift pins, etc.; steels containing from 0.81 to 0.90 per cent. carbon, for peen hammers, skate blades, cold chisels, etc.; those containing from 0.91 to 1.00 carbon, for chuck jaws, spring, hatchets, etc.; those containing from 1.01 to 1.10 per cent. carbon, for lathe centres, auger bits, axe bits, etc.; those containing from 1.11 to 1.20 per cent. carbon, for files, cold cutters, stone cutting bits, and similar purposes, and those containing from 1.21 to 1.30 per cent. carbon, for dies for heading machines or similar purposes.. The best grades in the different tempers are used for such purposes as button sets, band saws, drop forging dies, cutlery, large and small taps, threading dies, milling cutters, twist drills, chasers, gravers and many other purposes.

Hardening and Tempering Feature.

Considerable progress has been made in the hardening and tempering of carbon steels within the last few years; but a visit to the hardening rooms of many plants that are supposed to be up-to-date in all particulars reveals the fact that adequate equipment for hardening and a knowledge of the critical points of steel, with the changes that take place when it is heated, as well as others that occur in drawing the temper, are in many cases lacking. The results of not heating or drawing the temper accurately, and the irregularities of antiquated methods of forging or treating have in a great many cases wrought disaster to a piece of good steel, and the entire blame has been placed on the manufacturer.

It is impossible in the scope of this paper to give accurate forging or hardening tempers for each grade or temper of steel, or even to state the exact degree to which they should be drawn. In general, when forging, however, it is good policy to heat slowly and uniformly at first, before raising the temperature to

*From a Paper read before the Metal Trades' Foremen's Club, Dayton, Ohio.

**Cincinnati Manager, The Vanadium Steels Alloy Co., Latrope, Pa.

the exact forging point, to insure an even distribution of heat throughout the piece. When heating in a blacksmith's forge, the fire should be kept clean and of ample volume to surround the piece completely. Always use extreme care so that the air blast does not strike the steel when heating; also see that there is a good bed of clean fire between the tuyere and the steel. Dirty fires are cause of many failures and in many cases of local overheating or burning.

When heating for hardening, ample time should be taken to heat the steel slowly to the hardening point. Extreme care should be taken to protect it from the action of a direct furnace flame, and also from any other causes that may interfere with successful hardening. The greater the care, the better the results. Always be sure of a perfect distribution of heat. Avoid overheating thin parts or edges.

Hardening Expensive Tools.

A good suggestion to follow in hardening tools when the operator does not know the amount of carbon contained in the steel is to cut a small piece from the end of the original bar, and harden it at different temperatures. A hardness test with a file, and the appearance of a fracture will enable you to determine the least possible hardening heat that will be necessary to give the steel to insure the proper hardness. This plan should be followed especially when making up expensive tools. as the results obtained will more than compensate for the amount of labor expended.

Best results in hardening are obtained when the heating is done in a muffle furnace, either oil or gas fired, as in these furnaces the steel does not come in direct contact with the flame. The successful hardening of delicate tools depends largely on the condition of the atmosphere to which the steel is subject; whether it is oxidizing, reducing or neutral in character. Carbon steel, it is generally conceded, can be hardened most favorably in an atmosphere where the oxygen in the air is entirely consumed. In an atmosphere of this nature, the scaling or oxidation is reduced to a minimum. It is because of these general conditions that the electrically heated furnace is now spoken of so highly for hardening purposes.

It is very evident that, to get the best results from tool steels, they must be hardened and tempered properly. To do this, certain apparatus is necessary, such as proper heating furnaces, adequate cooling baths, the proper tools and tongs, and, last but by no means least, a good pyrometer. Whether the operation is forging, hardening or tempering, there is for each grade and temper of steel, and the particular use thereof, a well defined temperature point that alone gives the best results in work. A marked variation from this temperature may do irreparable damage. The use of a suitable pyrometer is recommended for all hardening purposes, and a pyrometer or thermometer for obtaining the temperatures of all drawing baths. When using a pyrometer, reasonable care must be exercised to see that the readings are truthful and reliable. Pyrometers may frequently go wrong, and unless the operator is an experienced hardener, the results may be disastrous.

The Hardening Medium.

In most cases, water is used as a hardening medium for carbon steels. Where extreme hardness is desired, a solution of salt water, brine or ice water can be successfully used. In other cases, articles to be hardened are quenched in a bath of water, and before they are cold, or have ceased contracting, they are removed from the water and placed in oil. This is true of such articles as milling cutters, some forms of punching dies, taps, reamers, etc. Some steels require to be quenched in oils only. Lard, fish or whale oil is preferable for this purpose, but any recognized light tempering oil will do. However, heavy fatty or mineral oils should be avoided. In all cases, the cooling baths should be of ample size, and a temperature as nearly uniform as possible should be maintained.

All tempering of carbon steel should be done in an oil heated bath or other medium by which the drawing temper can be kept uniform. For taps, dies, reamers, milling cutters, etc., relieving the strain is all that is required. In other tools, where toughness is the predominating factor the temper may be drawn slightly more.

Decarbonization.

When we say a piece of steel is decarbonized, we mean that the surface, for a few thousandths of an inch deep, has lost some of its original carbon during the process of annealing. All annealed steel is more or less decarbonized, and when intended for tools of any description that are to be subsequently hardened, sizes large enough to permit the removal of at least 1-32 in. on a side should be ordered. Failure to remove the outer surface of annealed steel of all grades or tempers will consequently give trouble in hardening.

The Alloy Steel Feature.

The term alloy steel is used to distinguish steels containing nickel, chromium, vanadium, titanium, or other elements in varying percentages, from the carbon steel in which the characteristic properties are dependent upon the presence of carbon alone. Up to the last two or three years, nickel steel was, perhaps, the most used of all the alloy steels. It is usually made in the open-hearth furnace, and contains from 0.20 to 0.50 per cent. carbon, and about 3.50 per cent. nickel. Lower carbons than these are sometimes used for case-hardening purposes. This steel has many excellent mechanical qualities, and is generally conceded to be a good free cutting material.

Chrome Steel.

Referring to chrome steel, I am personally familiar with a variety of this steel containing from 0.80 to 1.20 carbon, and from 3 to 3.50 per cent.. chromium. This steel is used specially for hot work with excellent results, as for gripper dies, bolt header dies, riveting dies, and what are known in fabricating or boiler shops as bull dies. It can be easily annealed under exactly the same conditions as carbon steel, excepting that the annealing temperature is slightly higher;, in this state it is very free cutting. When properly hardened, and used for the purposes stated above, the users expect to get from six to ten times as much work from this steel as from ordinary die steels. Actual records show where riveting dies have driven over a quarter million ⅝ x 2 in. rivets without redressing.

Chrome-Vanadium Steels.

Chrome-vanadium steels of numerous types are now manufactured. The service and test records of this class of steel show remarkable results, and its use will be greatly increased in the near future. Vanadium in steel is supposed to impart anti-fatigue properties. Under proper heat treatment, this steel has been made to assume higher physical properties (expressed by the elastic limit, tensile strength, torsional test, impact test and bending test), than any other type of steel. It is largely used in automobile construction for driving axles, for gears, pinions, pins, pressed or stamped parts, valve steam. etc., in fact, it gives excellent service in any parts calling for strength or durability. It is especially recommended for all spring requirements and it is guaranteed to have three times the life of carbon steel spring.

Test Data.

Tests were made recently by an associate salesman of my firm to determine the relationship between carbon spring steel and chrome-vanadium steel for motor-cycle springs. The greatest durability was the prime requisite of these springs, and the test was of vital importance. A very ingenious device was constructed so that the end of each spring was made to oscillate under force from a shaper at the rate of 4980 vibrations per hour. It was found under proper heat treatment that carbon steel stood this test for an average of 36 minutes only, while chrome-vanadium steel averaged 5 hours and 40 minutes. The chrome-vanadium steels require a special heat treatment. The springs referred to were heated to 1350 deg. Fahr. and quenched in oil; the temper was then drawn to 700 to 900 deg. Fahr.

Chrome-vanadium steel for gears is proving the superiority of this class of steels. For this purpose, it is made in case-hardening and oil-hardening tempers. The oil-hardening type contains about 0.45 to 0.60 per cent. carbon, so that by merely heating to the proper temperature and quenching in oil, the gears are made sufficiently surface hard to withstand all ordinary wearing conditions, while the core is tough and strong.

The High Speed Steel Feature.

Since 1901, high speed steel has had a rapid growth, and extensive sales. Only those who have kept in close touch with its manufacture and uses can appreciate the tremendous amount of work in the way of efficiency tests that has been necessary to bring it to its present state of perfection. With the introduction of vanadium into this grade of steel about 1908, a very important step was taken. Now, all good grades of high speed steel contain more or less of this element.

Vanadium Addition and Grinding.

In regard to this, numerous tests have proven that a steel that will cut at 10 per cent. faster speed, will last twice as long between grinding (if the speed is not changed), and a steel that will stand a 20 per cent. faster speed will run four times as long between grindings. A steel that will stand 30 per cent. faster speed before it reaches the breaking-down point will last eight times as long without sharpening, if the same speed is used.

Each addition of 0.3 per cent. of vanadium adds 10 per cent. to the possible cutting speed, and doubles the life of a tool at the same speed and feed. It has been shown that 0.3 per cent. vanadium allows 10 per cent. increased speed, or 10 per cent. more metal removed in same time; that 0.6 per cent. vanadium allows 20 per cent. increased speed or 20 per cent. more metal removed in the same time; that 0.9 per cent. vanadium allows 30 per cent. increased speed or 30 per cent. more metal removed in the same time.

Stating the effect in terms of increased times between grindings, it has been shown that 0.3 per cent. vanadium doubles the time between regrindings, that 0.6 per cent. vanadium quadruples the time between regrindings, and that 0.9 per cent. vanadium gives eight times as much metal cut between grinding at the same speed and feed.

High Speed Steel Tools.

I contend that high speed steels containing vanadium will run much longer between sharpening, in proportion to the quantity of vanadium they contain, up to 1¼ per cent. High speed steel is used for such purposes as lathe and planer tools; it is invaluable for swan-neck tools; special dies, which have heretofore required very great care in hardening; punches, boring tools, cutters, straight drills, twist drills, special taps, hard wood knives and all kinds of milling cutters, and it is especially valuable for involute or gear cutters in which accuracy of form and long life are necessary. These steels are usually furnished annealed by the manufacturer, and it is the best policy to permit the manufacturer to do all the annealing for the user. However, should it be found necessary to anneal a piece of this steel, the following is a good method of procedure:

Annealing Procedure.

"For all annealing purposes, use an iron box or pipe of sufficient size to allow at least one-half inch of packing between the steel to be annealed and the sides of the box or pipe. Pack carefully with powdered charcoal or lime. Cover with a cap which should be air tight. Heat slowly to a full red heat; say, about 1,500 or 1,550 deg. Fahr., and hold at this heat from two to eight hours, depending on the size of the piece being annealed. Cool as slowly as possible, and do not expose the steel to the air until it is cold."

The Furnace Feature.

Electrically or gas fired furnaces designed for high heats are now made to do very satisfactory work in hardening this class of steel. Tools to be hardened should be heated to a white heat just below the blistering point. The heat should be the highest possible in view of the importance of preserving the cutting edge. The higher the heat, the better the results. Proper care should be taken to heat slowly and uniformly to the proper hardening temperature, also to avoid overheating thin parts or sharp edges.

Tools of this class of steel can be either quenched in oil or other semi-active medium, or in some cases the whole tool can be cooled in the air blast. In all cases, the temper should be drawn to relieve the strain, or to the proper degree to get the best results.

Drill Jig and Fixture Design and Construction

By H. R.

The sketches and data will, the writer hopes, appeal to machine shop superintendents, designers, toolmakers, and novices, as indicating the large place jigs of every kind and for every service occupy to-day in machine shop practice. The present article is the first of a series.

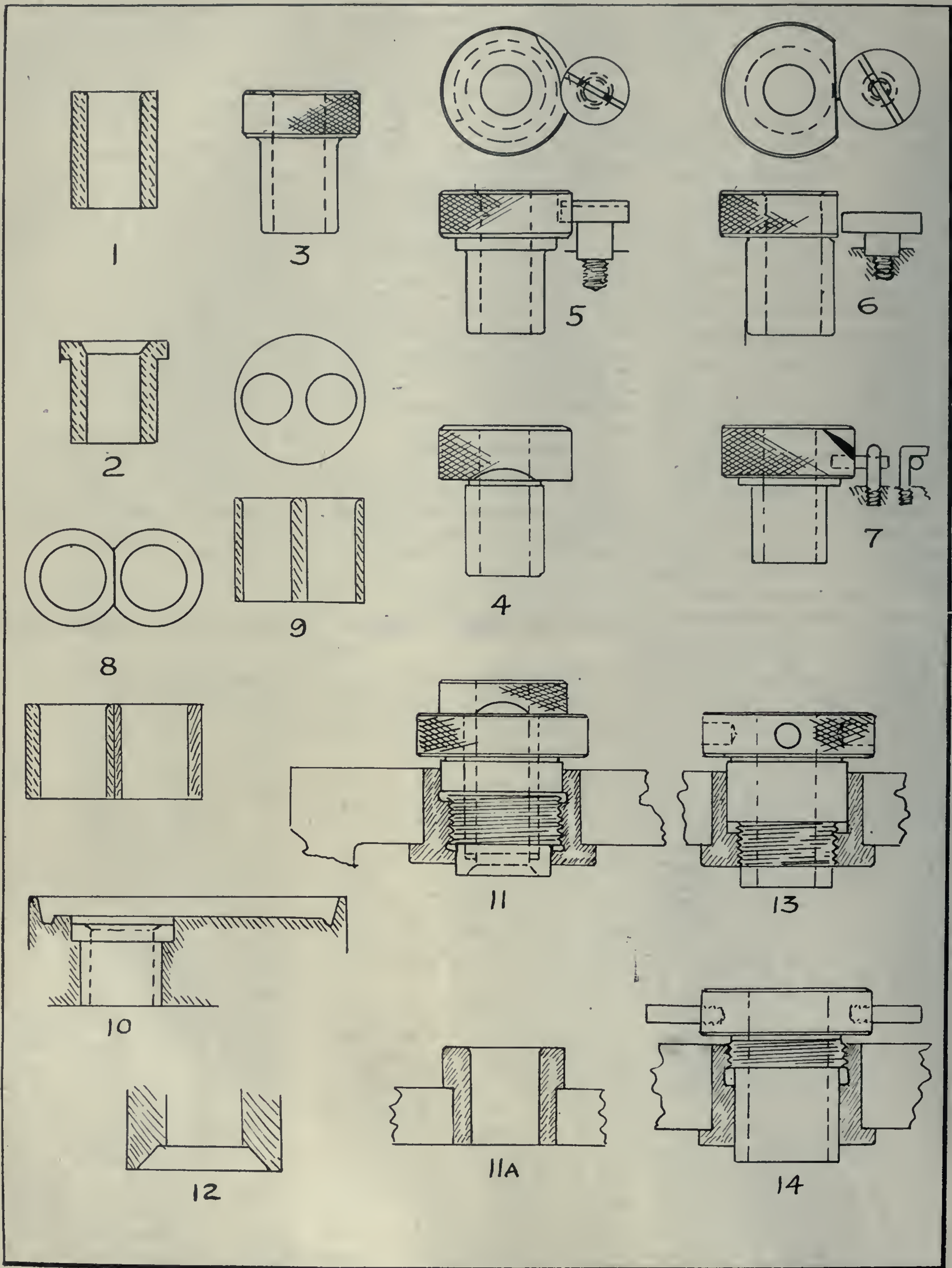
IN jig and fixture design, the field for ideas is immense. By a new method of clamping the work in the jig, it may mean the saving of hundreds of dollars or even more in workmen's time alone. There are many useful ideas lost, simply because the toolmaker or designer has thought of new methods whether adapted to the particular work on which he was engaged or not and neglected to make a sketch of the device.

The Drill Plate Jig.

The drilling jig is one of the earliest developments in the line of appliances for making repetition parts. In the simplest form, it is merely a plate attached to the work, having holes corresponding in diameter and location to the holes to be drilled. The entire jig plate may be hardened, or as is more usual, the locating holes are in hardened steel bushings inserted into the body of the jig. With such a jig properly located, the laying out of each piece is avoided; the only error the operator can commit being to drill too small a hole or to omit one or more of them altogether.

Miscellaneous Jigs.

From the elementary plate jig there has developed a large class of remarkably useful metal manufacturing appliances. Other types of jigs are box jigs, which are used where holes are drilled in all or nearly all of the sides of a piece. In case of very large components, the sides are cut away where the metal can best be spared so as to make them easy to handle. It is necessary to have jigs extremely rigid so that they will not be distorted when the work is clamped in position, or under the pressure of the drill. On the other hand, as before mentioned, they should be as light as possible so that they may be readily handled by the operator. Of course, it is constant practice and experiment that leads to the successful production of jigs. They are often made so as to be suitable both for bronze and cast iron, off the same pattern. Good judgment should, however, be used in all cases. Another type of jig is the built-



DETAILS OF JIG AND FIXTURE DESIGN AND CONSTRUCTION.

up pattern, made from cast iron stock plates. These are cut and carved, and then afterwards screwed and dowelled together.

Some manufacturers argue that these are cheaper to make. When a rush job is required it is generally so, but I think a far better jig is obtained from a properly designed casting and at less cost. Other manufacturers, again, have adopted aluminium as a suitable metal out of which to produce their jigs. This is very good for work up to a few pounds in weight, but for weights above this, I think no metal can offer better results than a good iron casting. Besides, aluminium is an expensive metal out of which to produce jigs. One most important consideration in jig design is the selection of suitable locating points for the same piece in the fixtures of milling machines, etc. If this element is not properly considered, the relations between the drilled holes and other machine cuts may not be accurate, owing to variations in castings, forgings, or other pieces as are sure to exist.

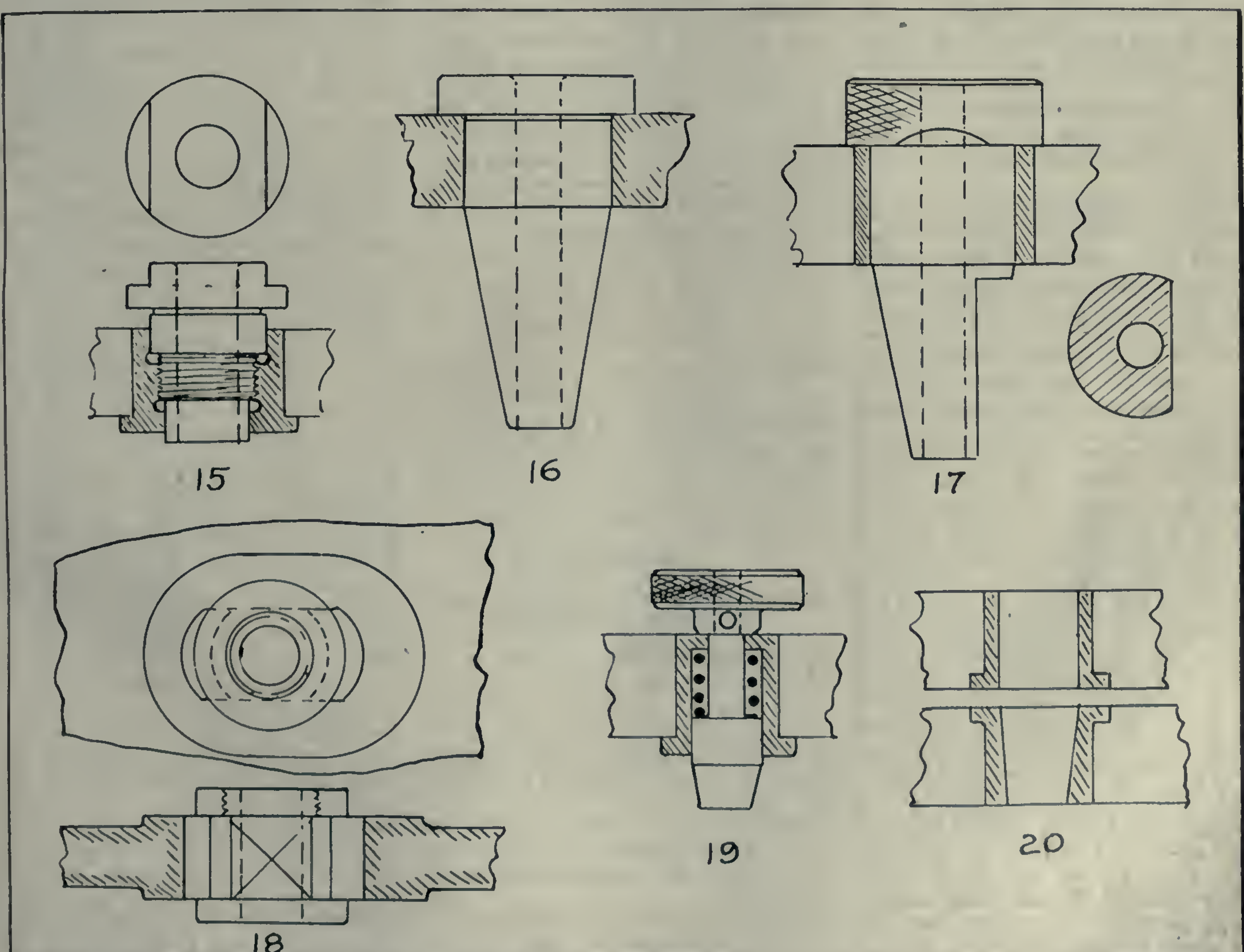
To explain the sketches herewith, Fig. 1 depicts the most common of all drill bushings. These are called fixed or stationary bushings. They are also used as linings for slip bushes. Fig. 2 is of the same type as Fig. 1, but with a stop collar formed. This is to prevent the bushing being pressed through the jig. These are more adapted for multiple spindle work.

When drilling and reaming operations are to be performed in the same jig, two slip bushings should be used, one for the drill and one for the reamer, and when the jig is to be used for a large number of parts, the hole for the slip bushing should in turn be bushed with a steel lining, Figs. 1 and 2, to prevent wear. The soft cast iron will wear rapidly if this is not done, and the jig will soon have to be rebored and rebushed. I have shown several types of slip bushes. Fig. 3 is the most popular. Fig. 4 is the same as Fig. 3, but is provided with a means of removing the bush if same becomes taut, owing to the swarf getting between the slip bushing and the liner.

Drilling Small Holes.

The drilling of small holes requires great speed or at least they can be run at many revolutions per minute. This means that some arrangement has to be made to keep the slip bushings from revolving with the drill. When this happens, the hole being drilled very often runs out of truth, owing to the drill having revolved the bush from its bearing long before the hole has been finished. To prevent this contingency, the drill slip bushings shown by Figs. 5, 6 and 7 appear to be those in general use, having proved successful through their easy manipulation and cheap production. Fig. 5 arrangement not only keeps the bushing from turning, but is held down by the screw (A). It will be as well to note the method adopted in fitting this into the jig.

If the jig is being used by a piecework man, it is bound to get very roughly handled, and in many cases these holding down screws get damaged so that they cannot be used often. The method shown has proved a way out of the difficulty. Fig. 6 simply keeps the bush from revolving, and Fig. 7 holds the bush down just the same as Fig. 5, but, of course, is cheaper to make. Very often designers are obliged to put holes



DETAILS OF JIG AND FIXTURE DESIGN AND CONSTRUCTION.

close together. Fig. 8 shows a very suitable way of doing this, while Fig. 9 is another way of getting over this difficulty.

Multiple Drilling.

In the past few years there has sprung up a great demand for multiple drilling. This has become popular in the manufacture of automobiles, for the drilling of crank cases, speed cases and other pieces which have a fair number of holes that are convenient to drill at one operation. In designing jigs for this class of work, special care should be taken so as to get all the drills well lubricated. A trough, such as is shown in Fig. 10, should be cast around the jig. This method insures all the drills running in lubricant and each one getting its equal share. If possible, the component should be set on hardened plugs, as the one great trouble in multiple drilling is to get the swarf clear away from the drills. The piece to be drilled should be set away from the bushes at least a quarter of an inch, for if the swarf clogs the drill, it is almost sure to break. A properly designed jig is also the chief feature of this class of work, although much depends on the feed and speed of the machine. Care must also be taken that the drills retain their sharpness. It is very convenient in multiple work to have a number of drills, and an equal number of reamers; this enables pieces to be drilled and reamed without changing for the latter operation.

Some jigs drill from all sides; in this way drilling from the sides and underneath, the swarf has a better chance of getting clear, than from vertical top drilling; but this method is only adopted when there are very large quantities to be machined or operated upon.

In making of jigs for small pieces, it will be sometimes found useful to clamp these by the bush. Figs. 11 and 15 illustrate the best methods for these particular bushes. It will be readily seen that the screwed portion is in the centre of the two plain pieces, and well out of the way of all swarf. It is impossible for the bush to get out of truth. It will also be noticed that this is designed for a slip bushing. The bush, Fig. 11a, shows a suitable method of fixing the bushings in conjunction with the screwed bush. This allows the drill to be put through the piece, being then reamed through another slip bushing, piloted by the bottom bush 11a.

A section is shown in Fig. 12 of a conical bush bottom. This is an excellent method of locating by the boss. Fig. 13 is another method of making these screwed bushes, being screwed down by means of a tommy bar. Fig. 14 shows another screw down arrangement by projections on the top of the bush. Neither Figs. 13 or 14 are as good as Figs. 11 or 15, because the straight portion is in the wrong place, and the screwed part in Fig. 14 is liable to get clogged up with swarf, making it hard to screw down on to the work.

Slip bushings should be made with only three or four threads for screwing down, and as much parallel portion as possible. It will be as well to note the method adopted of putting in the liner. The flange of this is always at the bottom. Great care should always be taken in fitting up of the jigs, and to see that plenty of clearance is given to the bushes, etc., so as to get them easily in place. This may mean the saving of scrapped jigs.

Sometimes it is necessary to drill a hole in a boss or place that it is impossible to get to except by a long bushing. Figs. 16 and 17 show two ways of doing this. Do not carry the bushing any nearer than three-eighths of an inch to the work. This will give the swarf a chance to get clear. Fig. 16 is a fixed bushing and Fig. 17 is a slip bushing.

Fig. 18 shows what is termed a floating bush. In some work there are bosses which should have holes through their centre. Now, owing to the variation in castings, the bosses do not always come as they should do. It may not be necessary to have the hole very accurate in relation to the other holes in the jig, but it would not make a good-looking job if this particular hole is out of line with the centre of the boss. A floating bush is here adopted.

Fig. 19 is the type of bush generally used for spring locating plugs, and Fig. 20, the method of fitting bushes that have to locate two plates together by a plug.

Bushings can be blanked out in quantities and finished to required sizes as needed. Small bushes up to half inch drill should be made of cast steel, and larger sizes in tool steel. Allowances should be made in the blanks for grinding and lapping after hardening.

HYDRO-ELECTRIC POWER MACHINERY CONTRACT.

THE unique position occupied by the Canadian General Electric Co. in the design and construction of Hydro-Electric power machinery is well shown in the contract recently awarded by the West Kootenay Power and Light Co. of Rossland, B. C., In order to increase the capacity of its plant, the latter company decided upon the addition of a 7,500 K. V. A. water wheel driven generator.

The Canadian General Electric Co. will build the generator, while the contract for the water wheel was placed with its subsidiary, the Canadian Allis-Chalmers, Ltd. This water wheel will have a capacity of 9,000 h. p. at 180 r. p, m., under a head of 70 feet. The contract, therefore, will be carried out practically by one firm, who are thoroughly familiar with the design and construction of both electric and hydraulic portions, and with the conditions necessary for their successful operation as one unit.

It is understood that the increase in the generating capacity of the West Kootenay Power and Light Co. has been undertaken in anticipation of the electrical requirements of the Canadian Pacific Railway which intends to electrify the line between Rossland and Castlegar. The contract for the electrification of this section of the railway was also awarded a short time ago to the Canadian General Electric Co.

MANUFACTURERS FROM THE UNITED STATES.

ALTHOUGH certain financial interests in the United States have been leaving only the very smallest stones unturned in their efforts to persuade those of their fellow-citizens who were thinking of emigrating to Canada that blue ruin and financial chaos were just one jump behind the Dominion, United States capitalists do not seem to have been seriously impressed by the arguments presented.

In the Provinces of Quebec and Ontario, there are 195 business corporations, whose head offices are in the United States, but which have been organized to manufacture goods in Canada for the Canadian and export trade. More than half of these companies have been organized in the last ten years. As far as Montreal is concerned, rather more than a third of them have come there in the last five years. Their total capitalization is \$230,000,000, which does not look as though the American investor who is looking for safe as well as remunerative opportunities to place his money was very much afraid of what the commercial future of the Dominion had in store.

When the amount devoted to manufacturing is added to the total which the farmer who moves across the border to an Alberta or Saskatchewan wheat ranch brings every year to the country, the expression of confidence in the stability of Canadian investments is as conclusive as it is comprehensive. The immigration authorities estimate that between \$100,000,000 and \$150,000,000 in cash is brought into the country every year by the farmers who emigrate from the United States.

The Theory and Practice of Screw Cutting on the Lathe

By J. Davies

The author of this series of articles intimates his intention of making the information sufficiently simple and clear, that apprentices and others with only the four rules of arithmetic at their command will be able to intelligently grasp the data and apply it in practice.

REQUIRED to cut .654 with a lead screw, 3 threads to the inch. Find ratio as per rule.

$$\frac{.654}{1000} \times \frac{3}{1} = \frac{1962}{1000} \text{ Ratio.}$$

Take the numerator, and divide it by the least prime number, in the table given in our last issue, as many times as you can; then by the next prime number in the table, and so on until you have exhausted the possibilities of further division. You will have then got all the factors contained in that number.

2|1962 Factors $2\times3\times3\times109 = 1962$.
3| 981
3| 327
109

Treating the denominator in the same way, we get

2|1000 Factors $2\times2\times2\times5\times5\times5$
2| 500
2| 250
5| 125
5| 25
5

In this example, one of the factors is 109, and by reference to the table of prime numbers, we see that 109 is a prime number, and cannot, therefore, be further divided. It would be impossible, therefore, to cut the above pitch without a gear containing 109 teeth or a multiple of 109.

Having obtained all the factors, arrange them into an equal number of groups for the driving and driven wheels, using as many wheels as may be convenient.

$$\frac{1962}{1000} = \frac{2\times3\times3\times109}{2\times2\times2\times5\times5\times5}$$

$$\frac{40\times25}{18\times109} = \frac{40\times100}{72\times109} \text{ the wheels required.}$$

Find wheels to cut .7854 screw ½ pitch.

$$\frac{7854}{10,000} \times \frac{2}{1} = \frac{15708}{10,000}$$

2|15708 2|10000
2| 7854 2| 5000
3| 3927 2| 2500
7| 1309 2| 1250
11| 187 5| 625
17 5| 125
5| 25
5

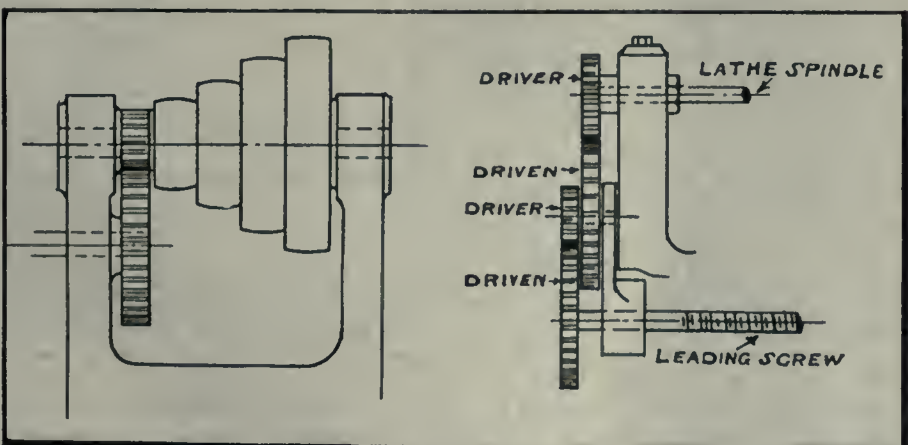
N.B.—This pitch was taken from a blue print given to a lathe hand in a Toronto machine shop.

$$\frac{2\times2\times3\times7\times11\times17}{2\times2\times2\times2\times5\times5\times5\times5\times5} = \frac{51\times77}{100\times25}$$

wheels required.

To prove the wheels, multiply all driving wheels together; then multiply all driven wheels together. The ratio should be the same as exists between leading screw and screw to be cut.

$$\frac{51\times77}{100\times25} = \frac{3927}{2500}$$



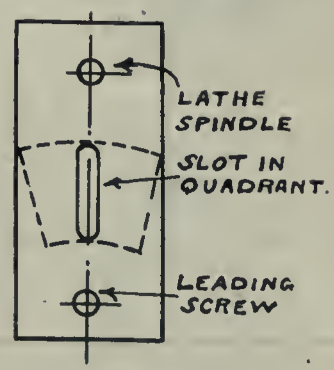
LATHE DRIVE ARRANGEMENTS.

Ratio of screw to be cut and leading screw $= \frac{7854}{5000}$

By finding a common denominator, it can be seen at once that the ratios are the same.

Cutting Very Rough Threads.

In cutting very rough threads, avoid as far as possible having a very small gear on the end of the leading screw, as it puts an excessive strain on the wheel teeth, and is a very fruitful source of broken teeth. Do not cut a very rough thread with a single train of wheels; for this reason it is much better to work out a compound set of gears enabling you to put a larger wheel on the leading screw, and thus reduce the pressure on the teeth.



SCALE OR TEST BOARD.

Another fruitful source of breakdown is putting the wheels too deep in gear. The apprentice usually has an idea that the wheels must be geared up to prevent backlash; this is a great mistake. Always allow a little clearance at the bottom of the teeth, and before starting the lathe pull it round by hand until every wheel in the train has made at least one revolution.

Scale or Test Board.

It is very annoying, after having worked out one or two sets of gears, to find out that it is impossible to gear them up after sweating and swearing and getting them all in place but one. To avoid trouble in this way, I would advise the apprentice to make for himself a scale or test board in the following way, and keep it for reference:

(1)—Find out how many teeth there are in one of the lathe gears per inch of the diameter, measured on the pitch line. This is known as the diametral pitch.

Suppose we take the wheel with 100 teeth, and find that its pitch diameter is 10 in. Then, a circle drawn to represent that wheel would be 5 in. radius. In the same proportion, 10 teeth would be $= \frac{1}{2}$ radius. Now if we draw this to a scale of $\frac{1}{4}$, then every 10 teeth will be represented by a circle $\frac{1}{8}$ radius. If the gears are 8 pitch, then 8 teeth will $= 1$ in. diameter, or $\frac{1}{2}$ radius, and 10 teeth will $= \frac{1}{2} \times 10 \times 8 = \frac{5}{8}$ radius.

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8

Reduced to a scale of 1-5, every 10 teeth $= \frac{1}{8}$ radius. Now measure the

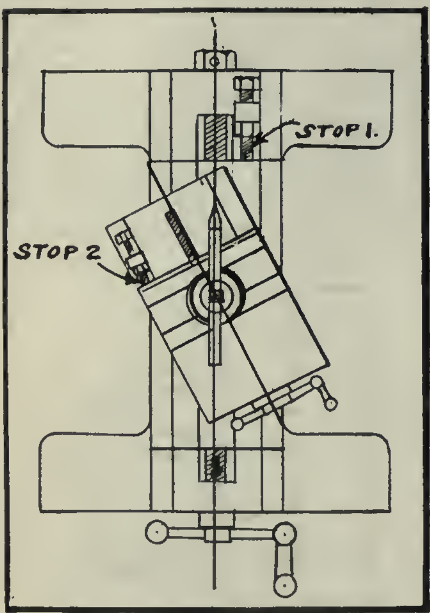


FIG 1.—CUTTING V. THREADS.

distance from the centre of lathe spindle to the centre of the leading screw, and draw it out upon a piece of board to the same scale as we used for the gears, which, for 10 pitch, will equal $\frac{1}{4}$ scale, and for 8 pitch, 1-5 scale. Sketch out the quadrant to the same scale.

To test the gears, take a rule and a pair of compasses and set them to equal $\frac{1}{8}$ for every 10 teeth, and mark them out upon the board. It will be seen at once whether the wheels can be geared or not. This test board can easily be made in half an hour. For future use, clean the surface with a piece of chalk, and to avoid confusion, put driving wheels in dotted lines and driven wheels in full lines.

It should be noted here that, in cutting a very rough thread, 6 inches or more, unless the lathe be specially designed for the purpose, the only alternative is to drive the lathe spindle from the leading screw through the train of chain wheels—in other words, the usual process is reversed, and put on the leading screw a pulley or other means of connecting it up with the most convenient countershaft.

Cutting a V Thread.

In cutting a V thread, the rest should be moved round 28 deg. for American threads, and $25\frac{1}{2}$ deg. for Whitworth threads. This is half the angle of the thread—2, Fig. 1. When the cut is put on, the tool cuts on one side only, the other side merely scraping or taking a very fine cut. This gives a cleaner and faster cut than is the case when the tool rest is left at right angles to the lathe centres, as in the latter case, the tool cuts on both sides, which means a less cut and a rougher finish.

In putting on the cut, it will be found very convenient to run the bottom slide up against a stop, Fig. 1, stop 1. At every cut, by this means, we get the tool back in the same place as it was when we started the previous cut. Next, put on amount of cut required by the top slide. This saves any bother of keeping track of the graduations usually marked on the traverse screw, or the more cumbersome methods of chalking. Makers of lathes do not put these stops on any lathes that I have seen, but any machinist can easily fix them up for himself. A number of screws have to be made all alike, while an adjustable stop can be fixed on the top slide, which limits the amount of cut that can be put on Fig. 1, stop 2.

In a lathe job to cut 1,000 copper stays for loco. fireboxes, the rest was fitted with these stops. After making the first one a good steam tight fit, and adjusting the stops, the lathe was run at a high rate of speed, and there was no necessity to bother about graduations or chalk marks; besides, it was very seldom we had to put one back into the lathe a second time.

Cutting Square Threads.

In cutting a square thread, the shape of the tool is a very important factor, for, while the tool must have the necessary amount of side clearance or rake, to give it more weakens it and makes it more liable to break, neither will the cutting edge stand up to its work as long, if it is not the right shape.

The following rule gives every satisfaction for finding amount of rake or side clearance required:

Draw two lines at right angles to each other (A B) and (B C). From (B) and on the line (B C) scribe an arc whose radius shall be equal to $1\frac{1}{2}$ times the diameter of screw to be cut. From (D) make a circle whose radius shall equal half the pitch, and draw a straight line, from where the two circles cut, to (B). This will give the angle or rake of the tool.

Mark off on a piece of tin or galvanized iron, and make a template, or, better still, make a gauge, as illustrated in Fig. 2. This would be useful to lend to the blacksmith, instead of having him guess at it, as he generally does. If a thread is to be made, and a nut to suit same, it is advisable to make the finishing tool slightly thicker at the root than it is at the point. This enables the nut to enter more readily. Another advantage, when the tool is sharpened by grinding the front cutting edge, is that it leaves it a little thicker, so that the sides can then be touched up.

A tool made this way smooths up the sides of the thread, and can be ground many times, and still retain its original size.

In a repair job, where a square threaded nut is to be made to suit an existing screw or vice versa, the apprentice needs to be reminded sometimes not to fit his tool into the space of the thread, but to take a pair of calipers and caliper the width of the thread, making the tool a little wider to allow the necessary clearance, and remembering that the tool cuts the space in which the thread fits.

Turn a narrow piece the width of the tool down to the size at the bottom of the thread before starting the first cut, as this saves a lot of time measuring. Leave the part to be threaded, at least the amount of the pitch longer, if at all possible, and turn it off after cutting to the depth required. This cuts away the fat or thick which usually

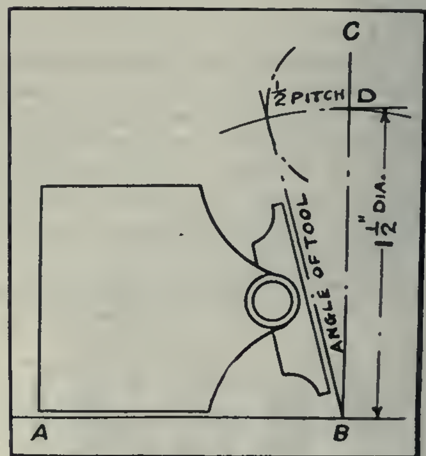


FIG.2.—TOOL SIDE CLEARANCE DIAGRAM

occurs at the commencement of the cut, owing to the tool having no support at the back, until it fully enters the thread.

Recent experiments on the flow of air through smooth sheet steel ducts varying in size from 12 in. to 48 in. diameter, at velocities ranging from 1,000 feet to 2,400 feet per minute, appear to show that the average value of the coefficient of friction is 0.00035.

Removal of Refuse From Machines in Industrial Plants*

By F. R. Still **

The mechanical removal of refuse and waste material from workshop and factory floors, particularly in the vicinity of machine tools, etc., forms a prominent feature of many industrial plants of varied product. The phases of the subject dealt with in this article, are treated in an interesting and instructive manner.

REMOVAL of waste material from machines in industrial plants by means of fans or blowers has been in general use for over 70 years. It is the most efficient and satisfactory method known; yet even now the minimum velocity or volume of air required to convey substances of varying specific volumes and densities is not known to any definite extent.

Determining Pipe Sizes.

Naturally little was known about the proper design and proportion of hoods, so considerable confusion existed for years as to the proper pipe size, but in due course of time a standard size of pipe was generally adopted for a given duty on a machine of a certain type and capacity, and these sizes have become almost universal.

The way these sizes were arrived at was very crude. In those days it was generally supposed that the pressure pushed the stuff along. Nobody thought it was the velocity, and even if they had thought of it, they had no known method of measuring the velocity, as an anemometer would be quickly destroyed at such high velocities.

The Pitot tube for measuring velocity was not generally understood, and , in fact, it is only within the last six years that it has been developed to an extent that makes it an accurate or dependable instrument of measurement. Hence, the experimenters would put up a system of pipes, add the areas of the branches together to determine the size of fan inlet, and then try the fan at varying speeds, try different shapes and proportions of the hoods, etc., until the system seemed to work all right. Probably, the very next job would fail to work because the piping system was more extensive or the outlet from the shaving vault was too small, thus causing undue back pressure or some other of the many things which can happen around such plants.

The first thing always resorted to was to "speed up the fan." If it worked it was "a fine job." If, however, that did not prove effective, then the remote sections of the main pipe were taken down, the larger pipe moved along and supplanted by still larger pipe near the fan, a larger fan installed and larger branches to those machines which did not seem to have enough "draw" to them. After several similar experiences by the different builders of such equipment, they all gradually arrived at one standard size of branch pipe for a certain duty, and these sizes have been quite closely adhered to down to the present time.

Investigations and experiments should first determine what velocity is required to move different substances of varying weights and bulk. Then should be determined what proportionate volume of air is required to move, in a unit of time, a specific volume of different substances having varying weights and bulk. Air pressure is only a measure of velocity and resistance, beyond which it has nothing to do with the moving of material, as many suppose.

Relative Area of Substances Moved.

The relative area of a substance has a great deal to do with the ease with which it can be moved by air. For instance, a comparatively low velocity will move a cubic foot of powdered coal which will pass through a 100-mesh wire screen. It will take double the velocity to move a cubic foot of coal which will pass through a 25-mesh screen, but a centrifugal fan cannot produce high enough velocity to move a cubic foot of coal in a solid block.

The same is true of many other substances; take for instance shavings and dust from planing mill machinery. Twenty feet per second will move the lighter dust; 40 feet will move the shavings; 50 feet will move the sawdust, but there are knots, blocks, etc., which also have to be taken care of, and these sometimes require 60 feet or more per second. Hence the velocity has to be selected which will take care of the largest and heaviest pieces likely to enter the system.

From this it will readily be seen how essential it is for economical operation to know what is the lowest velocity required to move a given substance, as the frictional loss multiplies directly as the square of, and the power to drive the fan directly as the cube of the velocity. For example, if only 40 feet per second is necessary, and 80 feet is provided and at the lower velocity it requires 25 horse-power, it would require 200 horse-power at the higher speed. This is not an absurd comparison, as there are many plants where just such a comparative waste of power is taking place.

Velocity and Air Volume.

Frequently the velocity as predetermined may be correct, but the volume of air for the volume of material to be handled in a given unit of time may be sufficient. In other words, the ducts are too small. Hence the fan has to be speeded up to create a higher velocity in order to move the requisite volume of air. This has exactly the same effect on the power as would the velocity if it had been figured too high at first.

An example of this latter character came under observation about a year ago in one of the largest mills in the South. Six very large double exhaust fans were installed, driven by direct-connected electric motors. The planing mill machines, all high speed, had three or four times the surfacing speed of the older types; hence there was proportionately a greater volume of refuse to handle. The pipes attached to the hoods on the machines, being about the standard size, failed to take care of the refuse properly. The owners, having lost confidence in the contractor who installed the plant, sent in the plans with a request that they be advised as to the best course to pursue to put the plant in a condition which would be satisfactory to them.

A careful analysis of the situation showed it would require 438 horse-power additional to do the work with the existing plant by speeding it up; whereas, by revising the plant on a larger scale, proportionate to the work to be done, it would require 156 horse-power additional. Therefore, the saving would be 282 horse-power by changing the plant over. At the conservative figure of $40 per horse-power per annum, this would indicate a saving of $11,280, which, at 5 per cent., would represent the interest on an investment of $225,000. The owners of this plant had spent thousands of dollars experimenting on processes to utilize the waste from this mill for making various by-products, some of which have great value; hence they were more conservative about the consumption of refuse for fuel than many others in a similar line of work.

*From a Paper read before the American Society of Heating and Ventilating Engineers.
**Of the American Blower Co., Detroit, Michigan.

Selecting the Fan.

If the fan selected is a size or two larger than the sum of the areas would indicate, it will do the work when running at a very much slower speed, and will require less power. For example, suppose the plant requires a 12-inch main, which with the branches and separator offers a resistance of, say, 4¾-inch water gauge. If a fan having a 12-inch inlet should be attached it would have to run at about 1,865 revolutions per minute, requiring 5⅞ horse-power; whereas, if a fan having an 18-inch inlet were attached to produce the same velocity, it would only have to run at 1,040 revolutions per minute, requiring 5¼ horse-power. Thus the speed would be reduced 44 per cent. and the power reduced more than 10 per cent.

Piping.

Where the branch pipes attach to the main, they should enter at an angle of not more than 45 degrees and 30 degrees or less is better. Never attach a branch at right angles to the main. Two branches should never enter the main directly opposite each other; also avoid the use of Y-branches, as the two currents in conflict retard the flow, sometimes causing the pipes to clog.

Elbows should have a radius in the throat twice the diameter of the pipe. For example, a 6-inch pipe should have a radius of 12 inches in the throat. There is no advantage in making the radius more than twice the diameter. A right angle elbow in a 6-inch pipe offers as much resistance as a straight pipe of the same diameter 44 feet long.

With a radius of half the diameter, it is equal to a straight pipe 15 feet long; with a radius of one diameter it is equal to a straight pipe 5½ feet long, and with a radius of two diameters, it is equal to a straight pipe 2¼ feet long.

Friction of Piping.

By making the radius more than twice, the resistance begins to increase again, until, at six diameters, it is equal to a straight pipe 3 feet long. This is due to the greater distance the air is under compression on one side of the pipe while making the turn.

Friction of the air travelling through the pipes is another and very essential point for consideration, and it must be determined in order to know the minimum speed at which the fan can be run. Careful experiments have shown that a length of round pipe from 62 to 72 times its diameter will produce friction equivalent to the velocity head, the shorter length applying to small pipes, because of the relatively greater resistance the roughness of the surface presents per unit of volume. In actual practice it is customary to allow about 40 diameters to compensate for branch tees, reducers, dents, etc. The refuse carried along by the air also increases the resistance somewhat.

Rectangular pipes can be compared with round pipes by multiplying the area of the square pipe by four, and dividing by the perimeter of the square pipe; the result is the corresponding diameter of a round pipe for the same velocity. The friction for varying diameters of round pipes is inversely proportional to their diameters at a given velocity. The friction of rectangular pipes at the same velocity varies inversely as the square root of their respective areas, and the friction of any pipe is directly proportional to its length.

Due to Small Pipes.

In the application of fans to the removal of smoke, fumes, fine dust, obnoxious gases, etc., great care has to be exercised in so designing the hoods that they will not interfere with the process, that they will not be in the way of the mechanics, and still be capable of catching the floating material before it gets into the room. Most failures in such installations are due to the pipes being too small.

For example, suppose a hood of conical form is 3 feet in diameter at the mouth, with a 7-inch pipe attached at the top. With a velocity of 4,000 feet per minute in the 7-inch pipe, the velocity is only 151 feet at the mouth, or less, about 2.5 feet per second.

A very efficient though somewhat expensive hood of this type is to put one hood inside the other, leaving about ⅜-inch space between, all around the bottom, and then run a nozzle from the apex of the inner cone up into the pipe which is attached to the outer cone. The nozzle should be about half the area of the pipe. With such a hood, anything that rises up into it cannot escape around the rim even if it is not drawn off by the central connection.

A common rough rule for determining the diameter of pipe for round conical hoods is to make the bell-mouth one foot larger in diameter than the apparatus it is to cover, and increase this diameter one foot for every 2 feet elevation above 2 feet; then to make the pipe one-sixth the final diameter of the mouth as thus determined.

How to Secure Humanized Office Efficiency *

By Leon Orr Fisher **

In the office as in the works, opportunity for the application of efficiency principles and ideas can readily be found, and in the various directions indicated by the writer, there exists ample scope for the display of effective practical and highly remunerative effort.

OFFICE efficiency is secured in much the same way as the mechanical engineer secures efficiency in the factory—namely, by working with and applying engineering principles, such as:

(1)—The study of physical conditions and determining in what way the office or physical plant helps or hinders production.

(2)—The elimination or reduction of waste or duplicate motion or effort by any means, methods or machines.

(3)—The positioning of groups of workers or departments with reference one to the other, with a view to securing direct forward action, so that the work received at one point will go continuously forward to its completion; and, in the same way, similar positioning of the workers, individually or in units, to accomplish the same result within each department or group.

(4)—The application of ingenious schemes and methods whereby, through the modification of existing methods, or the combination of several forms or lines of work, one effort can be made to produce one, two, three, four, five or more results, thus getting numerous by-products of the single effort.

(5)—The reduction, as far as possible, of memory work to a record basis, and hand work to a machine basis, thereby augmenting the capacity of every intelligent employe by increasing the time at his disposal for brain work, and decreasing the time wasted in leg work and hand work.

The Humane Feature.

While we are primarily seeking increased efficiency and, as a necessary result the truest kind of economy, we are also working humanely for the benefit of the men and women engaged in this class of work, because physically we are relieving them of many of the burdens which, under old methods, made them merely drudges and routine workers, and mentally we are raising the standard because of the increased op-

*From a recent address before the Efficiency Society, New York, in the Efficiency Magazine.
**Third Vice-President, Equitable Life Assurance Society.

portunity to employ brains rather than brawn. In other words, office efficiency depends upon individual efficiency, which, as we understand it, does not mean a rushing, nerve-racking, high-pressure service, but the energetic, orderly and intelligent use of each moment of the working day, and the employment of every means, method or mechanical appliance that will secure increased and improved production. In order to see how the physical condition of an office in its arrangement may be best adapted to promote the efficiency of the employees, we must consider:

Considerations to be Accounted.

(1)—That an office is a working tool and not merely a place in which to hive so many workers.

(2)—The space must be adequate, not only for the present, but with a reasonable margin for probable growth within a period of from three to five years. One of the most serious handicaps to office efficiency is the assignment of inadequate space to any branch of work and the necessary rapid disorganization brought about from changes which must be made to accommodate growth—these changes in turn disrupting the proper location of desks and files and encroaching upon necessary aisle space, also thrusting the workers into aisle space and causing loss of proper working space in front of files, etc. All of this results in cluttering up an office, the loss of its orderly arrangement and in an unconscious effect upon the clerks, causing them to become careless and unsystematic.

Practical Suggestions.

In considering the requirements and division of space and floor plan in arranging an efficient office, there are some suggestions which perhaps may be of practical value. For instance, a man at a standing desk, where other clerks are obliged to pass and re-pass him, should not be expected to work in less than 36 inches of aisle space, and if two are working back to back, there should be a minimum of 42 inches between desks. It might be stated right here that the better results are obtainable when all desks are arranged so that the clerks face the supervisor.

Where ordinary desk workers are placed in rows, there should be at least 42 inches from the working ledge of one desk to the face of the next desk back, in order to give proper space for the clerk to find chair room and provide aisle space back of the chair. Ordinary aisle space used as a thoroughfare should be at least 3 feet wide. The working space, in front of any file constantly referred to, should be at least 5 feet, and in relation to the general work-rooms of large concerns, experience has proven that the adequate space essential for each clerical worker is a general average of from 100 to 115 square feet, including provision for desk, chair, aisle space and room required for files and equipment.

In order to have an office flexible and adjustable to growth and changes, it is exceedingly desirable that there should be as few solid walls and as few partitions as possible, as these interfere with enlargement or change. It is hardly necessary to call attention to the great advantage, in connection with problems of supervision, of having the partitions, where used, of glass, and clear glass at that.

Light.

(3)—Next in importance to space are the twin questions of light and ventilation. Overhead lighting, in my opinion, is preferable to individual desk lighting from the point of view of securing a flexible office, permitting the maximum number of changes necessary at a minimum expense, improving the appearance of the office and conserving the eyesight of the clerks. The Curtis Publishing Co., of Philadelphia, after making an exhaustive study, in conjunction with professors from the University of Pennsylvania and leading oculists, opticians, and others interested in this subject, not only from an electrical engineering point of view, but from a psychological aspect, decided to install an indirect method in their important clerical work-rooms in order to get a thoroughly diffused soft light, the equivalent (as near as possible) of daylight.

Ventilation.

A close second to the question of light, in importance, is certainly that of ventilation. Every practical man has undoubtedly had a demonstration of this as early as 2.30 or 3 o'clock in the afternoon, if not earlier, when work-rooms not properly ventilated produce that peculiar effect upon the clerks which causes many of them to leave their desks with papers in their hands, and walk about from desk to desk or from floor to floor, without being able to give a plausible excuse for so doing. The real reason is that the air has become vitiated, the clerks have become sluggish, and the desire to work has vanished.

It is hard to state this proposition in percentage, but it is certainly conservative to say that this lack of ventilation in the majority of offices may be roughly stated as representing a loss of at least 25 per cent. of efficiency to the working force after 2 p.m. To my personal knowledge, this has been the determining factor in many insurance offices in deciding on early closing, on the score that practically little or no work is done after 4 o'clock in the afternoon, owing to the mental condition of the clerks due to the lack of sufficient fresh air in the offices. When our company moved to 2 Albany Street, with plenty of air and light, our efficiency increased at least 25 per cent.

The Building Equipment.

Unfortunately, an office depends largely for its efficiency upon the physical conditions imposed by its buildings. The space must be adequate and the force must be stationed with a view to the passing of the work; that is, the different groups of workers must be made to cog in with one another and create a smooth-working machine. Careful study must be made to avoid unnecessary floor travel. Mechanical appliances must be used to bring all the workers into closest proximity with one another by elevators, dumb waiters, mechanical pick-up and delivering devices and adequate and effective interior telephone service. Long corridors, intervening courts and lightwells, fire walls and fire towers and intervening elevator shafts and other building necessities must be carefully studied in this connection.

The location of vaults, store rooms, lavatories, wash-rooms, cloak-rooms and rest-rooms must all be studied with a view to keeping the working forces intact and preventing the considerable element of wasted time at the beginning and close of each session (morning and afternoon), as well as the absences which will creep in unless these matters are carefully considered.

Dressing and Toilet Rooms.

In a large force of several hundred or several thousand, it makes a great difference whether the clerks' time begins when they enter the building with wraps on, or whether their time begins when they enter the work-room ready for business, the arrangement of the office being such that they can put their hats and wraps in their lockers before registering their time. A stenographic department should have proper lavatory facilities so that soiled hands can be washed without leaving the room.

A considerable percentage in the actual working time of any clerical force is saved if toilet facilities are on the same floor and not several floors away from the work-room floor. It also means a great deal if vaults needed by any division are a part of the physical equipment of that division, and it is not necessary for clerks to leave their own work-room to refer to records in the vaults.

Employees Sub-division.

I might state that in our office we divide our clerks into several classes, namely:

Boys,
Junior clerks (male and female),
Senior clerks (male and female),
Special clerks (male and female),

Supervisory and technical (male and female), with some recognized sub-divisions under some of these headings, such as typists, copyists, phonographers, adding machine operators, multigraph operators and addressograph operators. Beyond all these classes are department or bureau heads, junior officers and executives.

We have studied the work of each class, and have established a system of minimum and maximum compensation, which permits the employment of clerks at a proper and reasonable initial salary, and gives them, while continuing in the same class, an expectation of increased compensation based upon merit and length of service, the understanding being that compensation beyond these maximums must be secured by promotion. We are endeavoring to provide ways and means for the education of the clerks of one class so as to make them eligible to enter the classes above them.

Specialization of Clerical Activities.

As to how far specialization of clerical activities should be carried, I would state that this is too broad a subject for more than mere mention here. I am a great believer in specialization; in fact, to my mind that is what complete organization requires. The work of each division must be analyzed, and the work properly distributed among those who by specializing are enabled to handle the largest possible volume in the shortest possible time, and with the smallest possible liability of error, and also to fix responsibility for work done.

There is, however, a point of safety beyond which specialization cannot be carried, in that we must have understudies to each and every position, so that the resignation, vacation or absence from any other cause will not handicap the work, and in order that we can, at all times, be prepared to make promotions; therefore, we do specialize in every department, but within well-defined limitations.

We are seeking to create conditions with insurance- co-operative store, rest rooms and other welfare work, both physical and mental, which will enable our clerks to give their undivided time and thought and best efforts, with a feeling of contentment in their position and loyalty to and pride in their company. I believe contentment of mind is the secret of good work.

Misfit Elimination.

Finally, I would say that the real secret of office efficiency lies in the human factor—the right man or woman in the right place. The first selection must be made intelligently, for we cannot make "silk purses out of sows' ears." The standard first established must be maintained, and this means proper methods for the development of the fit, the discovery of the unfit, and a continuous process of elimination of the latter. The supervision mlst be right; the administration just.

Our problem in office efficiency is to combine the best workers, best tools, and best supervision to get the best results in the least time, and at the least cost. There is nothing so dear as cheap help; nothing so cheap as really efficient workers.

The Chatter Mark Feature in Grinding Operations

The relation of wheel speed and work speed, and its effect in surface grinding—One cause of chatter marks and how to correct it.

CHATTER is the name applied to the phenomena which is sometimes present during a grinding operation, and when we remove the work from the machine, it is seen that the surface produced is not uniform, but uneven. This unevenness is referred to as "Chatter Marks." Another name for chatter marks is "Flats." This name is not strictly correct, because if applied to cylindrical grinding wrok, it conveys the idea that the flat places have been produced in the work, which is really not the case. On cylindrical work, chatter marks are really curved surfaces.

Causes of Chatter Marks.

There are various causes for chatter marks, the most prominent of which is vibration in the work. This in turn can be due to a number of causes, among which may be mentioned lack of rigidity in the machine on which the work is being performed, or intermittent work speed, which may be the result of wearing of the gears in the headstock, if the machine is gear driven; or if the work is directly driven by a belt, chatter marks may be produced by the intermittent motion applied to the work through the belt.

The cause of chatter marks can sometimes be laid to the grinding wheel. If the wheel is running out of balance, chatter marks will be produced. If the wheel bearings are not properly adjusted and there is considerable play present, chatter marks will be produced on the work. However, in cylindrical grinding, chatter marks which can be traced directly to vibration or out of balance of the wheel are not of the same variety as those originating with the work. Chatter marks caused by the work not revolving as it should are uniform, that is, the spaces between them are of equal distance; while chatter marks which can be traced directly to the wheel are irregular.

Different Wheel Speeds.

The two illustrations shown are of surface grinding. Figs. 1 and 2 are of the same piece of steel, ground on the same machine, with the same table traverse; hence, production per minute was constant, but there were different wheel speeds. In Fig. 1, the speed was 1,300 r.p.m., while in Fig. 2, it was 1,000 r.p.m.

We can consider production per minute to be made up of two factors, the number of chips produced and the average size of each chip; that is, if we should figure out the number of chips produced per minute, and determine their average size, the number of chips multiplied by the average size of each would give us the production per minute.

Let us take the situation where the wheel speed was 1,300 r.p.m., as a basis; then at 1,000 r.p.m. we have a decrease in speed of about 23 per cent. Now, the number of chips produced per minute is determined by the number of cutting teeth on the wheel's face times the number of revolutions which the wheel makes

FIG. 1.—SURFACE WHEN RELATION OF WHEEL SPEED TO WORK SPEED IS INCORRECT.

per minute. Therefore, at 1,000 r.p.m we have 23 per cent. fewer chips cut off in a minute than at 1,300 r.p.m. and since production remains constant, each chip must be 23 per cent. larger at 1,000 r.p.m. than at 1,300 r.p.m.

Cutting off large chips brings more pressure to bear on each individual cutting tooth than is brought to bear when a small chip is cut off, so that large chips will have a greater tendency to tear out cutting teeth from the wheel than would small chips. In other words, the wheel would wear enough to keep it cutting freely when producing large chips.

This is the condition which was present at 1,000 r.p.m., namely, enough pressure was being brought to bear on each cutting tooth so that the wheel wore enough to keep it free cutting, while at 1,300 r.p.m. there was not enough pressure on each cutting tooth of the wheel to tear out that tooth when it became dull. The wheel was then in a glazed condition; it did not cut freely and caused all kinds of trouble, such as intermittent motion to the driving belt, with the result to the work shown in Fig. 1.

At the time that this phenomena was observed, the particular machine on which the operation was performed was not adjusted for a faster table speed than was used for Fig. 1. Later, however, the machine was readjusted so that a faster table speed could be obtained, and just as satisfactory work as is shown in Fig. 2 was obtained with 1,300 r.p.m., wheel speed and a faster table traverse. In other words, in order to eliminate chattering on surface grinding, it is necessary to bring a certain amount of pressure to bear on each individaul cutting particle by making it do a certain amount of work in a given time, so that it will be torn away from the wheel before it has had the chance to become dull, and produce the phenomena shown in Fig. 1.

FIG. 2.—SURFACE WHEN RELATION OF WHEEL SPEED TO WORK SPEED IS CORRECT.

If the machine itself had been at fault, we could not have obtained satisfactory work at the higher table speed, because, as the amount of material cut off per minute, in other words the production was increased, our power must have increased likewise, and if the machine were at fault from the point of view that it was not powerful enough for the operation, we would have had a case of worse chattering than that shown in Fig. 1. The direct cause of this kind of chattering is, undoubtedly, local heating, but the indirect and most important cause is the fact that we have an improper relation between the wheel speed and the amount of material removed per minute for this particular grain and grade of wheel.

We are indebted to the Norton Co., Worcester, Mass., for the cuts and data contained in this article.

COBALT HIGH SPEED TOOL STEEL.

IN a recent issue of Stahl and Eisen there appears an account of the tests carried out at the Royal Technical High School, Berlin, on Cobalt high-speed tool steel. Of special interest, says The Iron Age, is the composition of one particular Cobalt steel. For the sake of comparison, the analysis of one of the ordinary high-speed steels used in the tests is also given. They are as follows:

	Cobalt steel "U," per cent.	High-speed steel "N," per cent.
Carbon	0.76	0.88
Silicon	0.28	0.28
Manganese	0.10	0.07
Phosphorus	0.010	0.018
Sulphur	0.032	0.036
Copper	0.06	0.07
Nickel	trace	0.06
Cobalt	5.03	None
Chromium	4.38	5.09
Tungsten	16.40	18.10
Vandium	0.62	1.16
Molybdenum (about)	0.30	0.60

The author states that the percentage of cobalt in this sample is rather high. It is interesting to compare the record of the results of these two steels in the series of tests. Each steel was made to cut hard chrome-nickel steel of 65 tons tensile strength in a lathe, until the tool was dull, at a speed of 83 and 66 ft. per min. with a feed of 1 mm. per revolution, and a cut of about 4 mm. thickness; and mild steel of 31 tons tensile strength in the same lathe, at a speed of 83 ft. per min., with a feed of 2.5 mm. per revolution, and a cut of about 10 mm. thickness; also cast iron of about 10 tons tensile strength, at a speed of 100 ft. per min., with the same feed and cut as the mild steel. The results of the tests under these conditions of the two steels referred to already are as above, including one other cobalt steel which ran unusually high.

	On Chrome nickel steel 83 ft. speed		On Chrome nickel steel 66 ft. speed		On mild steel 83 ft. speed		On cast iron 100 ft. speed	
	min.	sec.	min.	sec.	min.	sec.	min.	sec.
Cobalt "U"	5	6	13	54	6	22	9	55
High speed "N"	1	47	5	20	2	52	1	25
Cobalt "S"	5	26	25	36	..	..	..	..

High speed steel "N" is chosen for the above table as the one out of the number shown in Professor Schlesinger's tables which gave the best results of the ordinary tool steels. The end of each test was determined by the dullness of the tool, ascertained scientifically. To make the comparison complete, the value of each grade of steel was determined by dividing the endurance value by the price. The result of this on the hard chrome-nickel class, in the case of the three steels mentioned, was as follows:

	On chrome-nickel steel at 83 ft. speed	66 ft. speed
Cobalt "U"	40.80	111.50
High speed "N"	7.93	23.70
Cobalt "S"	43.50	205.00

Professor Schlesinger concludes his aritcle with the statement that the application of cobalt to the production of high speed tool steels exerts a marked influence in enhancing the value and endurance, without raising the cost price over the average market price.

DEVELOPMENTS IN MACHINERY

A Record of New and Improved Machinery Tending Towards Higher Quality and Economical Production in the Machine Shop, Blacksmith Shop or Planing Mill.

HEAVY CYLINDRICAL GRINDING MACHINE.

THE Norton Grinding Co., Worcester, Mass., has designed and built a heavy cylindrical grinding machine to swing 54 inches in diameter, and to grind work 18 feet in length. It has a capacity of 21 feet centres, and can be furnished to take any desired length between centres.

Equipment.

As will be noted from the illustrations, this machine is equipped for grinding heavy rolls, but can be supplied without this special equipment, being then suitable for grinding plain cylindrical work on centres up to its capacity.

Power.

The machine is arranged for motor drive only, the equipment being as follows:

One 40-h. p. motor mounted on the wheel carriage, for the revolution of the grinding wheel and wheel carriage traverse.

One 15-h. p. motor mounted on the headstock, for work revolution.

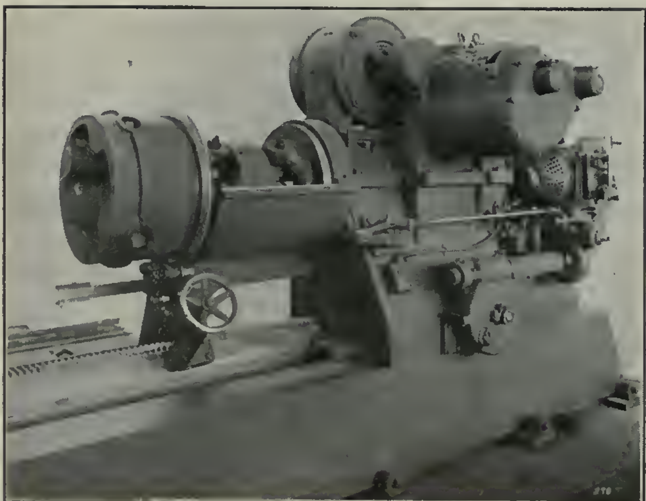
One 2-h. p. motor on the footstock, for traversing the footstock along the ways of the work base.

One 2-h. p. motor on the headstock, for traversing the headstock along the ways of the work base.

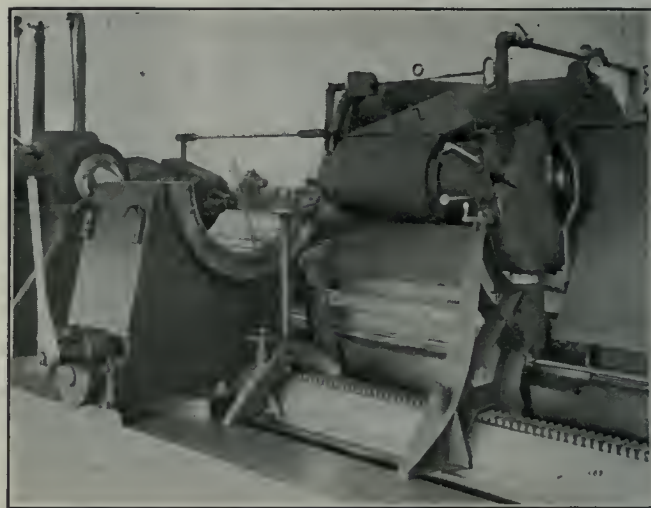
One 2-h. p. vertical motor upon the wheel carriage, for the pump revolution, and traversing of the grinding wheel at right angles to the work.

Control.

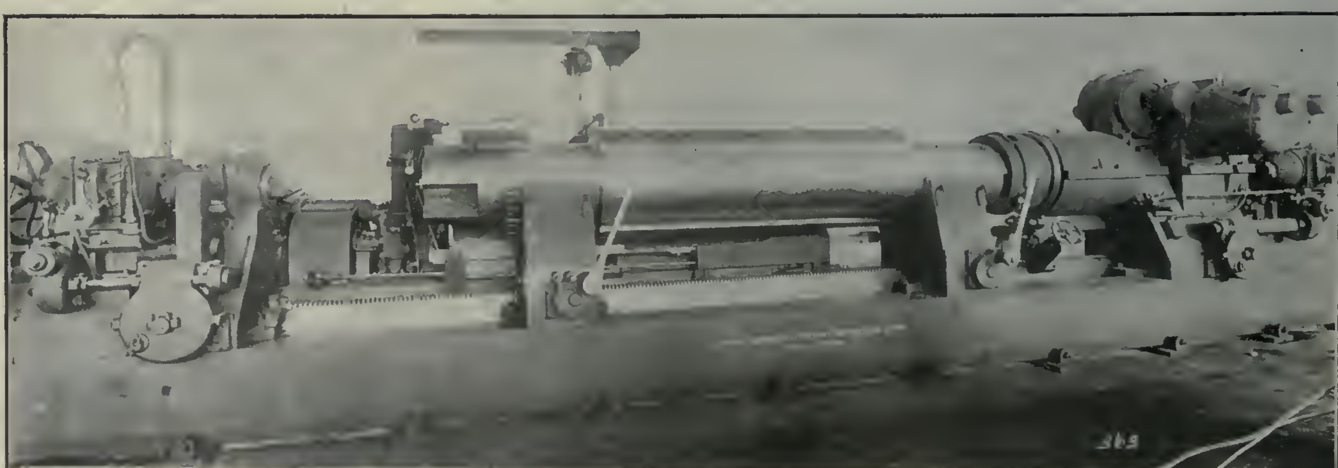
The machine is controlled from one position, the operator standing upon the wheel carriage beside the grinding wheel so that he can look directly down between the face of the grinding wheel and the face of the work which is being ground, and can see what is taking place at the point of contact between the grinding wheel and roll. Standing in this position, the operator can reach all of the hand wheels and levers necessary for starting and stopping the wheel revolution, starting or stopping the roll revolution, reversing the traversing wheel carriage either by hand or by power, moving the wheel carriage for delicate adjustments by hand, moving the wheel to and from the work either by hand or by power, starting or stopping the traverse of the wheel carriage, changing from



Near view of headstock of Roll Grinding Machine, showing universal joint, locater and driving sleeve.



Near view of journal rests with trammel for setting bronze shoes for correct diameter, and radial trueing device for shaping the corner of the grinding wheel for grinding fillets

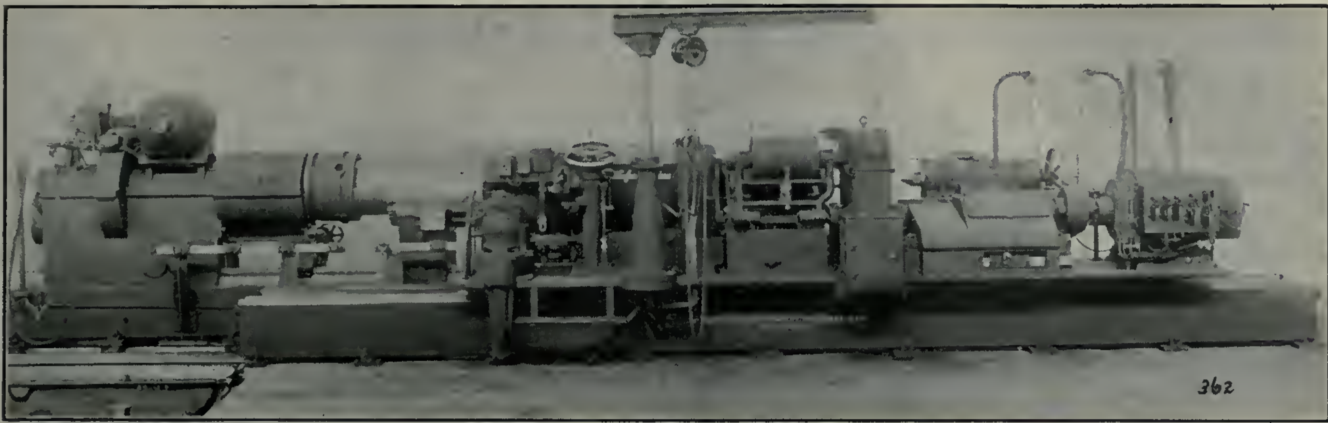


REAR VIEW OF ROLL GRINDING MACHINE, SHOWING ROLL IN POSITION FOR GRINDING.

maximum to minimum speed of the wheel carriage traverse, and controlling the amount of water or lubricant flowing over the wheel and work.

Referring to the illustrations, the operator uses the upper hand wheel for feeding the grinding wheel toward or from the work; one revolution of this hand wheel moving the grinding wheel a distance of .040 inches, corresponding to .080 inches reduction in diameter of work. If the grinding wheel is to be moved by power, the above hand wheel is disengaged by moving the lever at the right of the hand wheel toward the operator, and locking the lever in this position. This raises the hand wheel, disengaging it from the wheel feed mechanism, and at the same time releases the wheel traverse lever at the lower left-hand side. Moving the wheel traverse lever to the right or left operates a clutch, resulting in a movement of the grinding wheel either towards or away from the work.

These levers are so constructed that the power traverse cannot be thrown in until the hand wheel has been disengaged; nor can the hand wheel be engaged until the power traverse levers have been thrown out of engagement. The lever at the upper left-hand side of the hand wheels controls the stopping, starting and reversing of the wheel carriage. When automatic traverse of the wheel carriage is desired, this lever is placed in its lowest position. With the lever in the next higher position, the wheel carriage can be reversed or stopped by hand. With the lever in its upper position it engages the lower hand wheel with wheel carriage traverse mechanism, permitting movement of the wheel carriage by hand. The changes in speed of work revolution are accomplished at the headstock with change gears. Intermediate speed changes for traverse of wheel carriage are made on the front of this carriage.

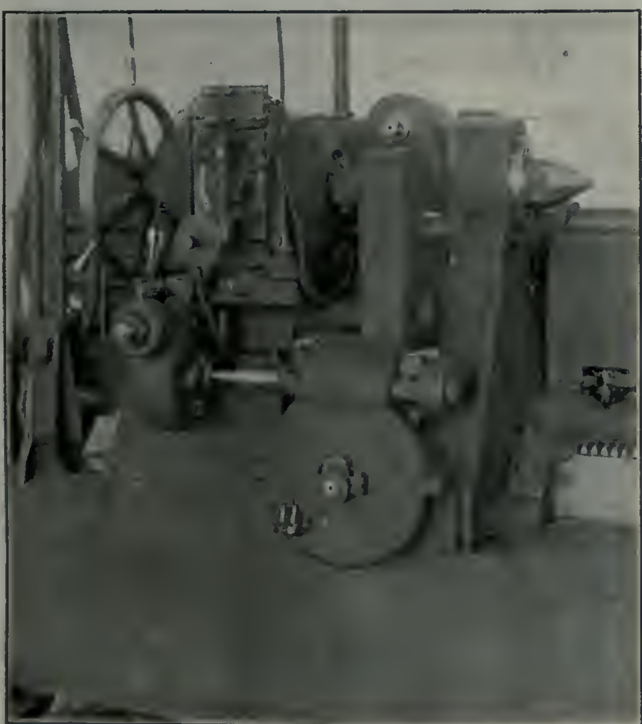


EW OF ROLL GRINDING MACHINE, SHOWING ROLL IN POSITION FOR GRINDING.

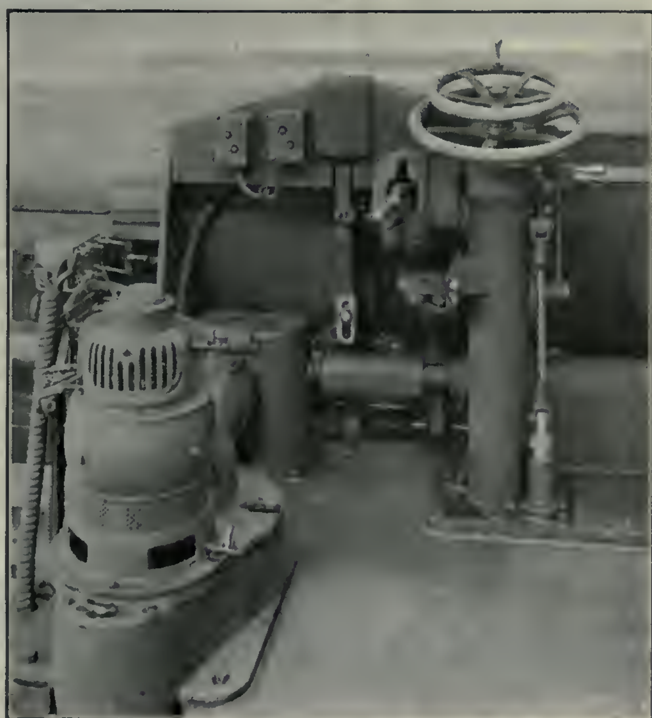
Ways and Maintainance of Alignment.

As this machine is designed for very large work, it is imperative that the ways in which the wheel carriage travels should be perfectly straight, and to obtain this feature, the Norton Pendulameter is used. This instrument permits the detection of errors as small as .001 inch at any point along the ways as related to parallelism and straightness. The ways are then scraped to master straight edges until the pendulameter registers a perfectly straight line.

It will be noted from the illustrations that the machine is provided with sup-



Near view of footstock of Roll Grinding Machine.



Near view of control of Roll Grinding Machine.

porting wedges which are self-contained so that the alignment of the ways can be corrected at any time, but the width and length of the bearing of the wheel carriage being so ample, it is very improbable that, with the machine once set and adjusted for correct alignment, any error can be detected after many years of use.

Single Wheel Design.

Years ago, Mr. J. Morton Poole invented the double wheel machine with a swinging frame to secure accurate diameters over the entire length of the roll, for the reason that at that time there were no known methods for producing and maintaining straight ways of sufficient accuracy to secure perfectly straight lines or uniform diameter of roll with a single grinding wheel.

The machine herein described is designed and constructed in accordance with the experience of recent years, viz.: That it is wholly practical to produce and maintain ways for a single grinding wheel which will secure absolutely perfect rolls, and, incidentally, the advantage of this single wheel is that, with the present design, it is possible to have the wheel large in diameter and of wide face, so mounted and provided with powerful drive as to permit the grinding, in a few hours, of rolls which formerly required a day or days for their grinding. Further, it is more convenient to place heavy rolls in the machine, or remove them, than is the case with a machine equipped with the double wheel.

Under the old system, a roughing cut was unknown. All cuts were practically finishing cuts, and hours, in fact days, were spent in the slow process of grinding with small wheels, not exceeding 14 inches or 15 inches in diameter, and not over 1 inch or 2 inches in width, while relatively small spindles and frail supports were provided for the carrying of these wheels.

In designing this machine, two objects kept in view have been accuracy and large production. The older line of double wheel roll grinding machines have produced accuracy at the expense of time. With the single wheel machine of modern design, advantage can be taken of greater weight and power securing accuracy and at the same time large production.

Production.

The first roll grinding machine of the type described in this article was shipped to a well known concern for grinding rolls to be used in the rolling of steel plate. The rolls are of various diameters and lengths, but the largest roll the customer expects to grind on this machine is 34 inches in diameter by 18 feet in length over all, although rolls 54 inches can be ground if desired. It will be noted by reference to the illustrations that the machine is equipped with massive pillow blocks and bearings for carrying the rolls upon their necks, the largest of these necks being 24 inches in diameter.

During the demonstration of this machine, rolls were ground in from one-fourth to one-half the time previously required for finishing the same rolls in the lathe. As yet there has not been sufficient time in which to definitely establish the conditions under which the machine will give the greatest output, but there is every reason to expect that greater savings will be shown after the machine has been longer in commission.

General Description.

The original design of Norton Plain Grinding Machines has been departed from in this case, for the reason that the work to be ground is of such size that in order to see the point of contact between the work and the grinding wheel, it is necessary for the operator to have control of the machine on the same side of the work as the wheel is grinding. He does, however, as in the standard machine, have entire control of all of the important functions of the machine while standing in one position, and without reaching over the work.

To secure perfectly smooth work, the rolls are revolved through helical gears, and large worm and worm wheels running in a bath of oil. Six speeds of work revolution are provided. The headstock spindle is 12 inches in diameter, the footstock spindle is 10 inches in diameter, the centres are 6 inches in diameter and are interchangeable.

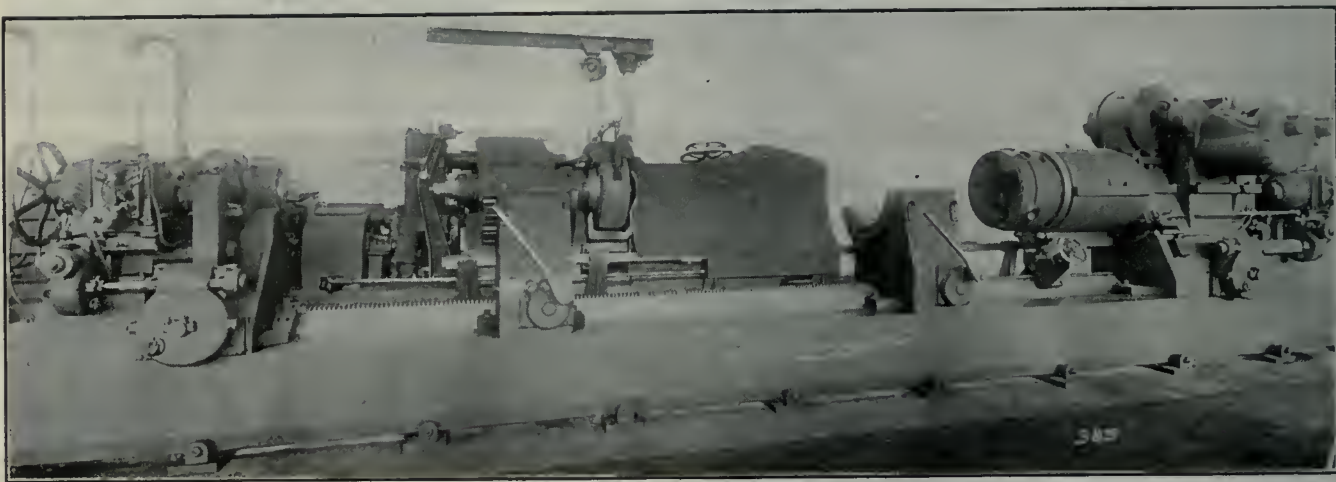
When grinding rolls carried on their necks, they are revolved by means of a large universal joint, in order to give a steady and uniform rotation of the work, one end of the universal joint being bolted to the face plate of the headstock spindle. To the other end is bolted a driving sleeve which clamps solidly to the wabbler end of the roll, revolving as a part of the latter. The driving sleeve and universal joint are steel castings.

When grinding work on centres, the universal joint, the universal joint case, and the driving sleeve are removed, and a driver is bolted direct to the face plate on the headstock spindle.

The wheel head with its spindle, wheel guard, wheel sleeve and wheel, weighs over 5,000 pounds, and rests upon a solid wheel head base mounted on the long, heavy traversing wheel carriage, making it possible to grind the roll rapidly.

Provision is made for grinding the necks of the rolls either when carried on the machine centres or when the rolls are revolved upon their necks in specially arranged bearings, and machines can be supplied either with or without the footstock, the footstock not being necessary for grinding the roll necks, it being entirely practicable to grind rolls both on necks and bodies when carried in these specially arranged bearings.

The pillow block bearings for use in



REAR VIEW OF ROLL GRINDING MACHINE, SHOWING ROLL REMOVED FROM BEARINGS.

grinding the necks, are arranged with multiple bronze bearings which are adjustable for the small variation in the size of necks, a pillow block being required for each standard size, the adjustment taking care of the variations from the standard. Perfectly round necks are guaranteed whether or not there are centres in the roll. A trammel is provided for adjusting the roll neck bearings to correct diameter, before the roll is placed in position for grinding, the design of this trammel being shown in one of the illustrations.
tion for grinding, the design of this

Fillets on the roll necks can be ground with the same wheel, and at the same time as the necks are ground. A forming attachment is also furnished, which is adjustable for any radius for the forming of the corner of the grinding wheel when fillets are to be ground. A truing device is also furnished for truing the face of the grinding wheel. The pump delivers about 30 gallons of lubricant per minute on the wheel and work.

Materials of Construction.

The materials in this machine are all high grade. The castings contain 20 per cent. steel, giving a very close grain casting of good wearing qualities. The wheel spindle is of the best chrome nickel vanadium steel, heat treated to a hardness which gives it extraordinary wearing qualities. The grinding wheel sleeve is a steel casting, as is also the wheel guard, this guard weighing 600 pounds. The shafts are made of the best carbon steel and carefully ground to size. The worm and worm wheels are of best procurable material for the purpose, and were made by the Brown & Sharpe Mfg. Co.

Helical gears in the headstock are of steel, as are also many of the other gears in the machine, where strength and durability is required. All racks are of solid steel. The pillow blocks for roll necks are steel castings, while the adjustable bronze bearings in these pillow blocks have been specially selected. The adjusting wedges under these bronze bearings are of high-carbon steel.

All bearings, where necessary, are self-oiling. All oil holes are covered with a small iron cap which cannot be easily broken off, but is easily seen by the operator. All oil holes are of ample size. When desired, an attachment can be supplied which will permit the grinding of rolls with either a concave or convex face. The machine as shown in the illustrations is arranged for grinding rolls either straight or with straight tapers, whether or not the rolls are carried on centres when being ground. The equipment, as shown, for grinding rolls, weighs about 100,000 pounds.

AN ULTIMATE NECESSITY.

ELECTRIFICATION of steam roads is an ultimate necessity. Progress is, however, slow. It has been absolutely shown that electrification, particularly at points of heavy traffic, saves 25 per cent. to 35 per cent. in operating charges. It is the initial expenditure that causes every manager to hesitate. The average estimate runs close to $5,000 per mile.

Railroad men were slow to accept the merits of electric operation, but experiences of the great lines successfully conducting suburban zones have at last brought conviction. The saving has been demonstrated, flexibility of service and added comfort of passengers is admitted. It is now a question of capitalization, and uncertainty as to limitations that governing commissions might impose.

A DEFINITION OF SCIENTIFIC MANAGEMENT.

IN a recent issue of the Journal of Political Economy, scientific management was thus defined:

(a)—It is a definite working policy applicable wherever human effort is put forth.

(b)—It is the introduction of the laboratory method in everyday affairs.

(c)—It is the acceptance of the dictates of science, instead of those of personal opinion and tradition.

(d)—It is the establishment of the fact that not to know is no crime—that the crime is not being willing to find out.

(e)—It is a type of co-operation more intensive than the world has yet seen.

(f)—It is filling in—not bridging — the chasm between capital and labor.

(g)—It is making our industrial life square up with the best we know in our personal and social relations.

(h)—It involves a very radical change in the attitude both of the men and the management to the work on which they are mutually engaged.

BOILER MANUFACTURERS' CONVENTION.

THE American Boiler Manufacturers' Association will hold its 25th annual convention in Cleveland, Ohio, September 1 to 4, inclusive, with the Hollenden Hotel as headquarters. This convention will prove of special interest to boiler and tank manufacturers and steel plate users in consequence of the proposed adoption of the standard and uniform boiler specifications, also from the fact that it celebrates the silver anniversary of the association. As Cleveland is centrally located, a large attendance is expected from Canadian and United States manufacturers and allied interests. The local committee have provided an excellent program of entertainment for the visiting ladies, and an excursion on the lake on Wednesday, September 3rd, for members and guests, has been arranged. The convention will conclude with a banquet on Thursday evening, September 4. All manufacturers and users of steel plate are invited to attend the convention and reservations for rooms should be made at once. M. F. B. Slocum, of the Continental Iron Works, Brooklyn, N. Y., is secretary.

MANUFACTURE OF CORRUGATED TUBES.

A NEW process for the manufacture of corrugated tubes has been patented by a Polish engineer. By this method, it is possible to corrugate either standard wrought iron or steel tubes, the corrugations being made by pressing the material together in a special machine. Ordinary steel tubing or lap welded and re-rolled tubes are used, according to the pressure and size required. One of the special features of the process is that although the tubes are shortened by the process, the corrugations are pressed into them at equal distances apart without decreasing the original internal diameter, and at the same time the wall thickness is uniform and the same as it originally was.

These tubes, it is claimed, can be made in all sizes from diameters of 1⅜in. up to 18in., the average length being about 12 feet. In very long lines, the tubes can be partly corrugated. The tubes possess considerable elasticity, which is, of course, an advantage in steam pipe lines.

LOW WATT CONSUMPTION LAMP.

THE latest development in connection with a low watt consumption per candle-power is reported from Germany, where, according to the Electrical Review, the A. E. G. intends to place on the market in the autumn a new lamp which is claimed to consume only one-half of a watt per candle, as compared with .8 watt to 1 watt per candle of the existing wire lamps. It is announced that another firm, which manufactures Osram lamps, will also introduce a lamp having a similarly low watt consumption. The figures, of course, refer to the Hefner candle, which has a value about 10 per cent. less than English candle.

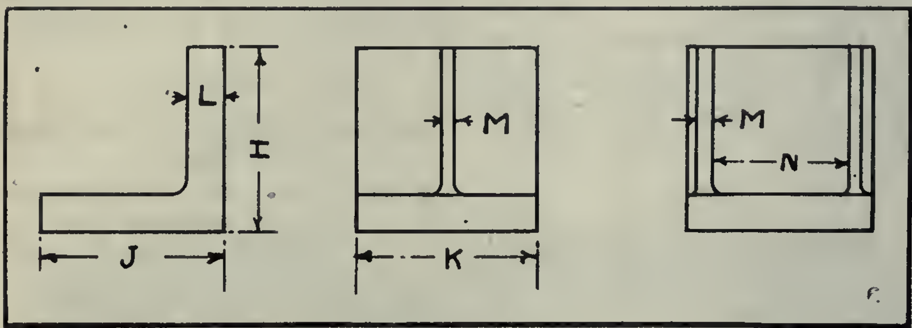
MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

USEFUL ANGLE IRONS.

By E. W. Tate.

THE accompanying line cut and tabulated dimensions illustrate a set of angle irons which will be found useful in the tool room, or, for that matter, in any part of the shop.



USEFUL ANGLE IRONS.

Single Ribbed Angle Irons.

H	J	K	L	M	N
4	4½	4	1	0	0
4	6	6	¾	0	0
6	6	6	1	0	0
8	8	6	¾	½	0
8	10	8	1	½	0

Double Ribbed Angle Irons.

H	J	K	L	M	N
6	9	6	¾	½	3
6	6	6	¾	½	3
9	9	9	¾	½	4½
12	9	9	1	½	4½
12	12	12	1¼	⅝	6
18	12	12	1¼	⅝	6
24	18	18	1¼	¾	9

LOOSE HEADSTOCKS—RIGHT AND WRONG.

By W. Crawdon.

WHEN using the cross adjustment of a loose headstock of a lathe to correct the alignment of the centres, or for turning taper work, there is a tendency for the loose headstock to be pushed backwards on the bed when the headstock is made as shown in Fig. 1, owing to the weight of work on the taper centres. This sometimes results in injury to the workman, on account of the job falling out. It will be seen that to make the cross adjustment it is necessary to slacken the clamping bolts which leave the headstock free to slide on the bed.

A better design of loose headstock is shown in Fig. 2, and in this case it will be noted that the set-over portion has separate clamp bolts other than those which secure the base portion to the bed, hence it is possible to make the cross adjustment without the headstock slipping back.

Another arrangement sometimes fitted, and which is to be recommended, in addition to the clamp bolts, is to have a rack cast up the centre of the bed between the shears, into which drops a catch hinged to the loose headstock. This method gives a better means of taking end pressure when supporting heavy work. The catch of course is provided with a handle to lift it out of engagement with the rack when moving the headstock back.—Pages' Weekly.

COMMUTATOR SLOTTING MACHINE EXHAUST SYSTEM.

THE mechanical department of the Nashville Railway and Light Co., Nashville, Tenn., has installed an individual exhaust system in connection with its commutator slotting machine. The system has not only been found desirable for removing the dust from the slotting tool, but has proved profitable because the dust is sold at 8 cents per pound. The amount of dust collected from the slotting necessary with the 150 cars owned by the company produces about $25 annually.

The exhaust system is composed of a No. 0 Sturtevant centrifugal fan, direct driven by a ½-horse-power motor, the exhaust duct extending from the slotting saw to a tank which serves for dust storage.

COATING FOR BELTS.

THE following coating for belts which are to be cemented at the joints is reported by Railway and Locomotive Engineering to be giving satisfactory results:

Take a good glue, add American isinglass equal parts by weight; place the material in a glue pot, and add sufficient water to cover the whole. Let the mixture soak ten hours, then bring the whole to a boiling heat, and add pure tannin until the whole appears like the white of an egg. Apply warm. Buff the grain of the leather where it is to be cemented, rub the joint surfaces solidly together, let it dry for a

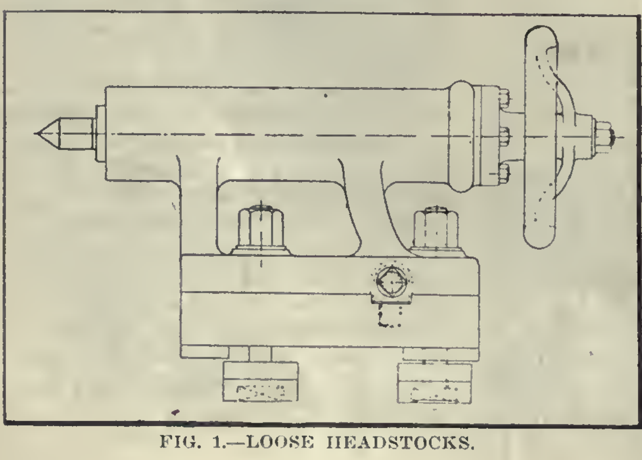


FIG. 1.—LOOSE HEADSTOCKS.

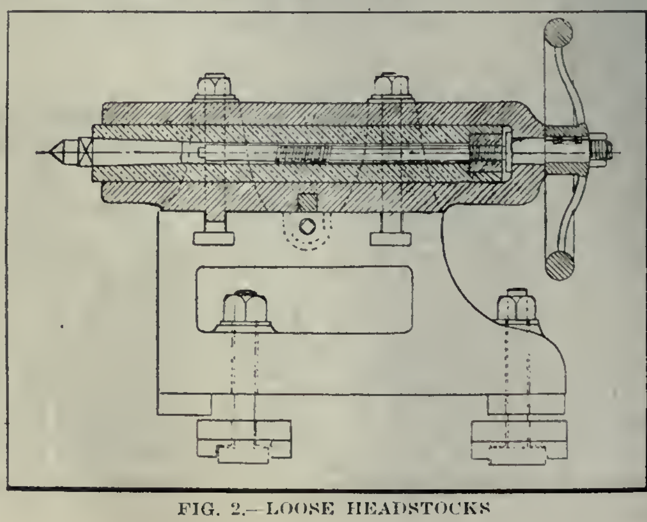


FIG. 2.—LOOSE HEADSTOCKS

few hours, and the belt will be ready for use. Tannin or tannic acid is an astringent substance used in converting hides into leather, and produces a surface on a cemented belt similar to the original leather.

METALLISING PROCESS.

A FEW years ago, says "Engineering," we noticed a process by Mr. V. Schoop, of Zurich, in which he coated various materials with atomised metals, by forcing a jet of steam or some gas under high pressure through the fused metal, and directing the spray of finely-divided metal, against the surface to be treated. Even paper, fabrics, and celluloid could be coated with liquid metals in this way; but there was difficulty in obtaining coherring coatings, because the finely-divided metal cooled too quickly. In a modification of his process, Schoop, therefore, started from powdered metal and hot gases under a pressure of about three atmospheres. Crucibles, originally required, were dispensed with in the newer process, but the noble metals could not be worked in this way.

Improved Schoop Process.

A further improvement of the Schoop process was recently described by Dr. Lach before the Verein zur Beforderung des Gewerbefleisses at Berlin. In this modification, the metal is used in the shape of a wire or a tape, which issues from a nozzle, and which is surrounded by a flame fusing the wire. The gases, mixtures of oxygen or hydrogen, or of other gases and air, leave the nozzle under high pressure, and carry the fused metal with them. The apparatus is about the size of a heavy revolver, and bears a certain resemblance to it. One tap, turned by hand, admits or cuts off the compressed gas and the air. This compressed gas mixture operates a small turbine, which makes 30,000 revolutions per minute, and sends the gases into the nozzle. The turbine drives a worm gearing which turns the two rolls gripping the wire, and the arrangement is such that the wire-feed keeps pace with the rate at which the wire is being fused.

How the process is worked to yield deposits which either adhere to the object or alloy with it, or which can subsequently be taken off by the reproduction of patterns, was not explained by Dr. Lach, who showed numerous examples demonstrating the wide range of applications to which the process lends itself. Thus pipes and utensils can be coated with tin, lead, or aluminium, inside and outside. When the pressure is low, or the distance large, the metallic particles will unite to a porous conglomerate: accumulator-plates are made in this way. Solid resistance-tapes for electric heaters can, on the other hand, be directly deposited on the insulator.

The utilisation of the process seems to promise well for the purpose of applying anti-corrosion coatings, because the metallic spray will penetrate into crevices and fill up sharp corners, so that a uniform smooth surface, little liable to rusting, is produced. That the process may become a dangerous rival to electric galvanizing, and to electrotyping, will readily be understood. Any object, no matter of what shape, can be galvanized by the spray after having been sand-blasted, and the lecturer showed, among other exhibits, a replica of a picture post-card of Cologne Cathedral, which had been produced by applying a rather sharp pressure in printing the card, so that the pattern came out in relief. A miniature relief map of the Alps was also reproduced in iron, which, it is noteworthy, can also be sprayed by the modified process.

Wood and paper are "bronzed" by the Schoop process, seamless tubes and cigarette mouth-pieces are made by it, and the metallized balloon fabric shown was pliable. That the coatings will in some cases consist rather of the oxide than of the metal may be an advantage. Finely-divided iron would easily rust, for instance, but dry iron oxide is a very stable compound. We should add that Mr. F. Herkenrath has collaborated with Mr. Schoop in developing these metallizing processes.

HEATING OF CIRCUIT BREAKER CONTACTS.

IN the Electrical World, F. W. Harris points out that a common source of complaint is the heating of the contacts of circuit breakers after the apparatus has been in service for a long period. These breakers, as commonly constructed, have a laminated brush made up of thin leaves of copper, and any temperature over a certain very well-defined maximum will result in the brush becoming soft and losing its elasticity. The heating therefore, becomes very much worse, rapidly approaching a crisis which results in a more or less total ruin of the brush and sometimes a shut-down of the plant.

In a certain case, an examination of conditions showed that the troublesome circuit breakers were connected on a circuit that was never opened, except upon dead short circuit conditions, and these conditions did not obtain more than once or twice a year. The whole trouble was traced to a gradual oxidation of the contacts, and to the fact that the troublesome circuit breakers were never opened and closed to rub off the oxide. It was found that if the breakers were opened and closed a few times on Sundays, it was possible to keep the contacts bright.

DIESEL ENGINE TROUBLES.

WRITING on "Gas Power Topics" in the columns of the Power User, Mr. W. A. Tookey says that probably the most serious trouble that occurs in Diesel engine operation is the loss of compression pressure due to the wearing of the piston rings and of the cylinder wall. The reversal of the stresses between piston and cylinder that occur during the cycle of operations, due to the side thrusts caused by the angularity of the crank, is responsible for this wear, and it becomes essential to remove the piston, say, once in six months, for the renewal of the piston rings, or at least one or two of them.

When, after several years of work, it has been found, upon measurement, that the cylinder of an engine has become considerably "out of round" it will be recognized that this is an important matter which cannot be neglected. It is for this reason that those who have had experience in the running of Diesel engines would like to see it become common practice for trunk pistons to be abolished in favor of outside crossheads, as in steam engine practice, for then the side thrusts could be compensated for by proper attention being given adjustable slippers and guides, and undue wear of the cylinder and piston rings would be practically things of the past.

CANADIAN TOOL EXPORTS TO SCOTLAND.

SCOTLAND imports few tools from Canada, and, it would appear after investigation, that the market is well worth consideration. Quantities of small United States tools are in daily use. Among the various classes of machinery imported, agricultural implements are numerous, and it seems that Canadian manufacturers are fully alive to the demand, as many of them are represented in the leading commercial and agricultural centres. The imports at the port of Glasgow alone are valued at approximately $1,000,000 a year.

Acknowledgment.—In our issue of July 31 it was omitted to credit "Page's Weekly" with the article, "The Art of Improvisation a Valuable Factory Asset."

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Vol. X. AUGUST 7, 1913 No. 6

PRINCIPAL CONTENTS.

EDITORIAL ANNOUNCEMENT.

MR. J. H. Williams, who for the past three months has been sojourning in Great Britain and the Continent of Europe, whither he went to recuperate, has returned to his post on the editorial staff of this journal, feeling much improved in health and spirits. His headquarters will be in Montreal, from which point the editorial interests of Canadian Machinery in the Province of Quebec and the Maritime Provinces will be attended to and ,specially and fully featured.

SCHOOLS FOR MEN.

IN a recent issue of the "American Machinist," an article under the above title from the pen of "Entropy," attracted our attention, and while the necessity has all along existed, although becoming daily more accentuated, it seems somewhat strange that the question of schools or places of education for men has not been given more and earlier prominence. From a considerable experience in teaching subjects relative to mechanical and steam engineering, the lack of and desire for education among men in many sections of industrial activity, were features that it was impossible for us to disregard. Whether we admit it or not, the establishment of technical schools in industrial centres, does not and will not fit the requirement of schools for men, even although, as we are quite well aware that the latter are welcome to avail themselves of all or any of the courses of instruction.

It is not necessarily a man's fault that his education in boyhood, and from thence to manhood, has been neglected; rather, we should say in the majority of cases, has it been his misfortune. The surfeit of education which has always been a feature of schools generally has contributed largely to the lack of real knowledge and learning, because of the tendency to educational nausea, through an application to more or less immature minds, then incapable of absorbing. We have noted in mixed classes (men and youths), of ages ranging from 40 to 15 years, that the greatest difficulty was experienced in conducting these as a combination unit, there being, in spite of a strong desire to get knowledge, a sensitiveness and diffidence so keen as to be felt, on the part of the elders in the presence of those who were 20 to 25 years their junior.

As pointed out by "Eutropy," correspondence schools and the widespread disposition to take advantage of them furnish ample evidence of the desire and inclination on the part of men to acquire in the way of education, what mature years has made them feel both needful and capable of, and if schools for men were even only to assist in aiding the difficulties besetting the adult student in mastering the requirements of a correspondence school course, then the establishment of schools or classes for men would be worth while. It takes pluck, yes, we might call it almost recklessness on the part of men to become a fellow-student, with youths still in their teens, and out of the large number who need and want the instruction, a percentage of those with the dare-devil nature might easily be counted on the fingers of one hand. In the planning of the courses for our technical schools, the feature of classes for men, if schools are unobtainable, would supply a much felt want, and yield results which would not only compare, but might surpass those of budding youth.

I am not a warm advocate of a lot of foolish, misapplied, maudlin sympathy that has paraded under the name of "welfare work." * * * The welfare work that I believe in, is that which makes it possible for the man to help himself, but it does not include the holding of a milk bottle to his lips after he is weaned.—C. W .Post.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

		Per Ton.
Foundry No. 1 and 2, f.o.b., Midland	$17 00	$16 50
Grey Forge, Pittsburg.	.....	14 65
Lake Superior, charcoal, Chicago	.....	16 25

	Mont'l.	Tor'to.
Canadian f'dry, No. 1..	$19 50	$18 50
Canadian f'dry, No. 2..	19 00	18 00
Middlesboro, No. 3....	20 00	21 50
Summerlee, No. 2	22 00	26 50
Carron, special	22 00	.....
Carron, soft	21 50	.....
Cleveland, No. 1......	20 50	22 00
Clarence, No. 3	20 00	21 00
Jarrow	.....	23 50
Glengarnock	.....	26 00
Radnor, charcoal iron.	30 00	34 50
Ferro Nickel pig iron (Soo)	.....	25 00
Staveley, No. 1	20 00	22 50
„ No. 3	20 00	22 00

BILLETS.

	Per Gross Ton.
Bessemer billets, Pittsburgh ..	$26 50
Open hearth billets, Pittsburgh	26 50
Forging billets, Pittsburgh	34 00
Wire rods, Pittsburgh	29 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto..	2.10
Steel bars, f.o.b., Toronto........	2.20
Common bar iron, f.o.b., Montreal.	2.10
Steel bars, f.o.b., Montreal.......	2.20
Bessemer rails, heavy, at mill....	1.25
Iron bars, Pittsburgh	1.55
Steel bars, Pittsburgh, future	1.40
Tank plates, Pittsburgh, future...	1.45
Beams, Pittsburgh, future	1.45
Angles, Pittsburgh, future	1.45
Steel hoops, Pittsburgh	1.60

F.O.B., Toronto Warehouse.	Cents.
Steel bars	2.30
Small shapes	2.40

Warehouse, Freight and Duty to Pay.	Cents.
Steel bars	1.85
Structural shapes	1.95
Plates	1.95

Freight, Pittsburgh to Toronto.

18 cents carload; 21 cents less carload.

BOILER PLATES.

			Mont'l.	Tor'to.
Plates, ¼ to ½-in., 100 lbs.			$2.35	$2.35
Heads, per 100 lbs.........			2.65	2.95
Tank plates, 3-16 in.			2.60	2.60
Tubes, per 100 ft.,		1 inch	9.50	8.50
"	"	1¼ in.	9.50	8.50
"	"	1½ "	9.50	9.00
"	"	1¾ "	9.50	9.00
"	"	2 "	8.75	8.75
"	"	2½ "	11.15	11.50
"	"	3 "	12.10	12.00
"	"	3½ "	14.15	14.50
"	"	4 "	18.00	18.00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Stove bolts	80 & 7½
Machine bolts, ⅜ and less	65 & 5
Machine bolts, 7-16.......	57½
Blank bolts	57½
Bolt ends	57½
Machine screws, iron, brass	35 p c.
Nuts, square, all sizes.....	4c per lb off
Nuts, Hexagon, all sizes..	4¼ per lb off
Flat and round head.....	35 per cent.
Fillister head	25 per cent.
Iron rivets	60, 10
Wood screws, flathead, bright	85, 10 p c off
Wood screws, flathead, brass	75, 10 p c off
Wood screws, flathead bronze	70, 10 p c off

National-Acme "Milled Products."

Sq. & Hex Head Cap Screws	65 & 10%
Sq. & Hex Head Cay Screws	65 & 10%
Rd. & Fil. Head Cap Screws	45-10-10%
Flat & But. Head Cap Screws	40-10-10%
Finished Nuts up to 1 in. ..	75%
Finished Nuts over 1 in. ..	72%
Semi-Fin. Nuts, up to 1 in...	75%
Semi-Fin. Nuts over 1 in.....	72%
Studs....	65%

Disconnts f.o.b., Montreal.

WROUGHT IRON PIPE.

The following are Toronto jobbers' disconnts on pipe in effect from April 21, 1913:

	Buttweld		Lapweld	
Standard	Black	Gal.	Black	Gal.
¼ ⅜ in.	62	47	....	....
½ in.	68	58	....	....
¾ to 1½	71½	61½	68½	58½
2 in.	71½	61½	68½	58½
2½ to 4 in. ..	71½	61½	70½	60½
4½ to 6 in. ..	....	....	71½	61½
7, 8, 10 in. ..	....	....	66	54

X Strong P. E.

¼, ⅜, ½in. ..	56½	46½	....	....
¾ to 1½ in. ..	67½	57½	....	....
2 to 3 in.	68½	58½	....	....
2½ to 4 in. ..	....	....	65	55
4½ to 6 in. ..	....	....	64	56
7 to 8 in.	....	....	55	45

XX Strong P. E.

½ to 2 in.	43	33	....	....
2½ to 4 in. ..	....	....	43	33

PRICES OF WROUGHT IRON PIPE.

Standard. Nom. Diam.	Price. per ft.	Extra Strong. Sizes Ins.	Price per ft.	D. Ex. Strong. Size Ins.	Price per ft.
⅛in	$ .05½	⅛in	$ .12	½	$ .32
¼in	.06	¼in	.07½	¾	.35
⅜in	.06	⅜in	.07½	1	.37
½in	.08½	½in	.11	1¼	.52½
¾in	.11½	¾in	.15	1½	.65
1 in	.17½	1 in	.22	2	.91
1¼in	.23½	1¼in	.30	2½	1.37
1½in	.27½	1½in	.36½	3	1.86
2 in	.37	2 in	.50½	3½	2.30
2½in	.58½	2½in	.77	4	2.76
3 in	.76½	3 in	1.03	4½	3.26
3½in	.92	3½in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4½in	1.27	4½in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.86	...	.....
7 in	2.38	7 in	3.81	...	.....
8 in	2.50	8 in	4.34	...	.....
8 in	2.88	9 in	4.90	...	.....
9 in	3.45	10 in	5.48	...	.....
10 in	3.20	....	....	...	.....
10 in	3.50	....	....	...	.....
10 in	4.12	....	....	...	.....

IRON PIPE FITTINGS.

Canadian malleable, 40 per cent.; cast iron, 65; standard bushings, 70; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 75; malleable, lipped unions, 65.

COKE AND COAL.

Solvay Foundry Coke	5.95
Connellsville Foundry Coke	5.45
Yough, Steam Lump Coal	3.93
Penn. Steam Lump Coal	3.63
Best Slack	2.95

All net ton f.o.b. Toronto.

OLD MATERIAL.

Dealers' Buying Prices.	Mont'l.	Tor'to.
Copper, light	$10 50	$11 50
Copper, crucible	13 00	14 50
Copper, uncr'bled, heavy	12 00	12 50
Copper wire, uncrc'bled	12 00	12 50
No. 1 machine compos'n	10 50	11 50
No. 1 comps'n turnings	9 50	9 50
No. 1 wrought iron	.....	9 00
Heavy melting steel	.....	8 00
No. 1 machinery cast iron	.....	14 00
New brass clippings	8 50	8 50
No. 1 brass turnings	7 25	7 80
Heavy Lead	3 25	3 90
Tea lead	2 50	2 50
Scrap zinc	3 25	3 50

METALS.

	Mont'l.	Tor'to.
Lake copper	16.25	16.00
Electrolytic copper	16.25	16.00
Spelter	5.95	5.35
Lead	5.50	5.15
Tin	43.75	40.00
Antimony	9.75	9.25
Aluminum	21.00	18.00

SMOOTH STEEL WIRE.

No. 6-9 gauge, $2.35 base; No. 10 gauge, 6c extra; No. 11 gauge, 12 extra; No. 12 gauge, 20c extra; No. 13 gauge, 30c extra; No. 14 gauge, 40c extra; No. 15 gauge, 55c extra; No. 16 gauge, 70c extra. Add 60c for coppering and $2 for tinning.

Extra net per 100 lb.—Spring wire; bright soft drawn, 15c; charcoal (extra quality), $1.25.

SHEETS.

	Mont'l.	Tor'to.
Sheets, black, No. 28	$2 85	$3 00
Canada plates, ordinary, 52 sheets	3 10	3 00
Canada plates, all bright.	3 70	4 15
Apollo brand, 10¾ oz. (American)	4 30	4 20
Queen's Head, 28 B.W.G.	4 40	4 40
Fleur-de-Lis, 28 B.W.G.	4 20	4 25
Gorbal's Best Best, No. 28	4 40	4 40
Viking Metal, No. 28	4 40	....

NAILS AND SPIKES.

Standard steel wire nails, base	..	$2 40
Cut nails	$2 60	2 65
Miscellaneous wire nails	75 per cent.	
Pressed-spikes, ⅝ diam., 100 lbs.	.	2 85

FINE STEEL WIRE.

Discount 25 per cent. List of extras. In 100-lb. lots: No. 17, $5; No. 18, $5.50; No. 19, $6; No. 20, $6.65; No. 21, $7; No. 22, $7.30; No. 23, $7.65; No. 24, $8; No. 25, $9; No. 26, $9.50; No. 27, $10; No. 28, $11; No. 29, $12; No. 30, $13; No. 31, $14; No. 32, $15; No. 33, $16; No. 34, $17. Extras net. Tinned wire, Nos. 17-25, $2; Nos. 26-31, $4; Nos. 30-34, $6. Coppered, 75c; oiling, 10c.

MISCELLANEOUS.

	Cents
Putty, 100 lb drums	$2.70
Red dry lead, 5 cwt. casks, per cwt.	6.00
Glue, French medal, per lb	0.10
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.26
Benzine, per gal.	23½
Pure turpentine	0.60
Linseed oil, raw	0.60
Linseed oil, boiled	0.63
Plaster of Paris, per bbl.	2.10
Plumbers' Oakum, per 100 lbs.	3.25
Pure Manila rope	17

MONTREAL, August 4, 1913.—Generally speaking the machinery and allied markets remain rather quiet, although brokers maintain an optimistic frame of mind. There seems to be a general feeling that relief from the present money stringency will soon be in sight, and that trade will then make a very rapid recovery. Orders are expected shortly for the mechanical equipment of the new technical school at Edmonton, Alta., but outside of this enquiries have been scarce.

Metals.

Pig iron has been quiet for the last three or four weeks, in spite of very low prices. Although the consumption has been about normal, there has been no large buying, foundries contenting themselves with purchasing in a "hand-to-mouth" fashion. The present low prices in Canada are due to strong competition from Buffalo. However, in the United States a decided improvement in tone, with heavier movement, is now taking place, and it is probable that Canadian prices will tend to advance in the near future. Copper is firmer, with a good demand, but the tin and spelter markets continue to show a very weak tone. Lead is still very erratic in sympathy with the violent fluctuations of the London market.

Toronto, Ont., August 5, 1913.—The steel market is often considered a good criterion of the market in general. The rosy complexion taken on by the former during the past week is a good augury for the coming winter. A prominent agent for large American mills said today: "Business is steadier, but not much improved. Mill prices are absolutely firm. Manufacturers see that prices are stiff, and regard this as a good thermometer; consequently they are going ahead with more certainty, and are placing their contracts. Business is much better than three weeks ago. A Canadian dealer verified this statement, adding that he had found business as good during the past week as it was a year ago, and last August with this firm was exceptionally good. Buying is mostly done from warehouse, import trade being quiet. There is a brisk demand for boiler tubes, plates, sheets, angles, and shafting.

General.

A large firm of overhead runway and conveyor manufacturers report that they have more work in hand than usual, and prospects seem good for a continuation of these conditions. Some contracts, however, have been withheld until money conditions are better. A large percentage of their business is done in the West, whence all shipments are made sight draft against B|L. A large oil concern reports an increase in business during the past six months over the same period last year for Eastern Canada. A firm of gear makers have noticed no appreciable drop in business; in fact, July was their largest month for the year. There is a tendency, they say, on the part of the railways to cut their orders down to a minimum. They themselves admit ordering goods in moderate quantities.

Metals.

Business is brisker in metals. Copper advanced half a cent during the week. Consumers seem to be more satisfied with the market, and the biggest trade is being done in copper and tin, the latter selling at a very low level.

NATIONAL STEEL CAR WORKS.

A REPORT from Hamilton, which is believed to be correct, states that the Hamilton Steel Car Works of that city is now producing an average of 20 cars a day. The outlook is thought to be particularly bright, as orders are sufficient to keep the company operating at this rate till well into the autumn.

George Smith, formerly chief engineer for Lindsay, has been appointed chief Engineer for Midland, Ont.

American Automobiles.—Automobiles and automobile parts to the value of $40,000,000 were shipped from the United States in the past fiscal year, as against $1,000,000 worth in 1903. Canada was the largest buyer, having taken 7,200 cars valued at $9,200,000. England bought almost 4,000, valued at $3,000,000.

CANADIAN CAR AND FOUNDRY.

WHILE it is early yet to foretell with any degree of accuracy what the earnings of Canadian Car and Foundry Co. will be for the year ending September 30th, we understand that the next annual statement will show large increases in both net and gross earnings. Sales for the nine months' period just ended have been greatly in excess of last year, the three-quarter year's showing being little short of the entire year's business last year. Profits, too, have been good; and if the remaining three months are up to the averages, this year will come out a long way ahead of any other in the company's history.

Work on the Fort William plant is progressing favorably and the plant will be ready for operation by about the time navigation opens in the spring. The plant, irrespective of working capital will cost about $1,500,000 and will have a capacity of about 40 cars a day.

DRYDEN TIMBER & POWER CO.

THE Dryden Observer and Star published a very interesting description of the works of the Dryden Timber and Power Plant, which was completed last spring at a cost of $1,000,000. The mill is equipped with 140-inch board machines, having 40 driers, triple deck and two cylinder moulds. The buildings cover an area of 100,000 square feet. There are four digesters, each of 10 cords capacity. The boiler house is equipped with eight 22-horse-power Jenckes tubular boilers, and the machinery is all motor-driven from Hydro power. The power house contains two turbine units of 950-horse-power each, direct communicated to two 750 K. V. A. generators. Power is supplied by a dam 140 feet long across the Wabigoon River.

The company's timber limits consists of 250 square miles along the Wabigoon Lake. The total outlay for the plant, including the Hydro development, is more than $1,000,000. The capacity of the mill is 40 tons per day.

The company when organized in 1911 took over the assets of the Gordon Pulp and Paper Company, including timber limits, water rights, grounds, land, buildings and chattels.

The directors of the concern are Messrs. D. L. Mather, D. W. Bonfield, Willis Chitty, Francis Gibbs, S. Nesbitt, H. B. Shaw, G. A. Kingston. D. L. Mather is president.

NOVA SCOTIA STEEL AND COAL CO. OUTPUT.

SO far as the Nova Scotia Steel & Coal Co. output is concerned, the outputs for the present year are in excess of any previous half-year in the history of the company.

The following is a comparative statement of the outputs for the first half year in 1912 and 1913:

	1912.	1913.
Coal shipped	322,716	327,221
Coke made	39,630	53,253
Pig iron	24,930	40.043
Ingots	33,598	38,355
Finished material	31,899	33,625
Axles made	22,783	27,503
Total ore mined	248,450	271,911
Submarine ore mined.	17,327	127,211
Ore shipped	94,620	151,033
Limestone	26,792	34,579

MOTORS FOR REVERSING ROLLING MILLS.

A GERMAN firm is now building single motors for driving reversing rolling mills, with outputs up to 15,000 horse-power. One of the difficulties to be met was that, owing to the necessity of keeping the diameter of the armature as small as possible, unsatisfactory cooling conditions were set up. After many experiments, the firm has now definitely adopted the plan of cooling such motors by means of compressed air drawn from the outside. The stator is covered in on the opposite side to the commutator, except for a few small openings, the rotor being closed on the commutator side. The cooling air, which is led to the motor through filters by means of special fans, enters through an aperture in the neighborhood of the shaft, whence it follows a predetermined course. Part of the air is forced through the core slots, part through the openings in the motor covering, to cool the commutator, while the remainder is driven through the stator coils or through the air gap between the rotor and stator.

LONG SAULT POWER.

THE Hon. Clifford Sifton is revising the engineers' report of the Conservation Commission on the Long Sault dam project. From an engineering standpoint the dam is feasible, although it is believed that there will always be some risk as regards flooding. However, in spite of this latter danger it is thought better that power be developed on the Canadian as well as upon the United States side. The Commission is in favor of the State rather than a private corporation taking up the necessary development work. It is expected that this development work will mean serious interference with navigation on the St. Lawrence.

TORONTO VIADUCT.

WORD has been received by G. R. Geary, corporation counsel, that the Dominion Railway Board has approved of the plans and profiles for the new Toronto viaduct agreed upon between the city, the railway companies, and the Harbor Commissioners, after lengthy negotiations, and has ordered that the work be completed by July 29th, 1916.

LAKE SUPERIOR CORPORATION.

ACCORDING to an unofficial announcement, remarkable progress in earnings is being shown by the Lake Superior Corporation and its subsidiary companies.

The net earnings for the month of May, amounting to $270,339, before allowing interest, are said to show an increase of $104,308, as compared with May, 1912, a gain of no less than 63.2 per cent.

The showing made in the eleven months to the end of May, it is further added, reveals a yet larger proportion of increase, the net earnings being $2,108,943, against $1,194,558, a gain of $914,385, or 76.5 per cent.

Miscellaneous

E. F. Bradley has been appointed manager of the Toronto office of the International Engineering Works, Ltd.

K. S. MacLachlan, B.A.Sc., was recently appointed superintendent of the Metals Chemical Co., Welland, Ont., ore smelters and refiners.

C. P. R. Angus Shops.—Commencing August 1, the working hours at the Angus shops of the C. P. R., Montreal, were reduced from fifty-four to forty hours per week. This is in accordance with an agreement with the Federated Trades.

A. K. Beauvais, foreman for the Dominion Bridge Co., Montreal, which has the contract for the steel superstructure of the buildings of the Atlantic Sugar Refineries, Ltd., at St. John, N.B., has arrived on the job. Mr. Beauvais is one of the few survivors of the Quebec Bridge disaster, August 30, 1907.

Chatham, Ont.—During the month of July, Customs receipts at the port of Chatham total $41,271.59, which is over thirteen thousand more than for July, 1912. Almost every sub-port in the district shows an increase for the month. The local collector, D. R. Farquharson, is authority for the statement that this is a record for collections here.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Engineering

Regina, Sask.—It is reported that the Brand Stove Co. will erect a factory at a cost of about $100,000.

Toronto, Ont.—The roof of the Greey Foundry Co. plant was burned on Aug. 1 by a spark from the cupola.

Hull, Que.—The A. H. Coplan Co., Ottawa, will locate a foundry in this city. The estimated cost is $50,000.

Port Arthur, Ont.—W. Foote has commenced work on the excavation for a garage to cost $20,000, two storeys high.

Hamilton, Ont.—A factory and warehouse will be erected by the Otis Fensom Elevator Co. Architects, Stewart and Witton.

Dundas, Ont.—The ratepayers passed the by-law providing for the guarantee of $15,000 bonds of the Canadian Abrasive Wheels, Ltd.

Levis, Que.—La Fonderie De Levis has recently been opened by P. A. Beaulieu for making iron, brass, copper and aluminum castings, and for jobbing work.

Woodstock, Ont.—Robert S. Bickle, of Winnipeg, will instal a plant for the manufacture of fire fighting apparatus in the old auto factory here. According to the present plans, the Webb Motor Co., of Allantown, Penna., will join in this enterprise, building motor fire apparatus of all kinds and commercial cars.

Levis, Que.—The plant of the Canadian General and Shoe Machinery Co., Ltd., which went into liquidation several months ago is being operated temporarily by G. T. Davie & Sons, shipbuilders, Levis, who took over the business by permission of the court after asking leave to finish the contracts for machinery, pumps, fittings, etc., for Hopper Barge No. 1, which is being built by Davie for the Department of Marine and Fisheries.

Fort William, Ont.—The city is advertising for tenders for an addition to the street car barn on Walsh Street. The addition is to be of brick, 260 feet long, 30 feet wide, and 30 feet high, and it is the intention to have it completed about September 1, when Fort William takes over its half of the Port Arthur and Fort William Street railway. It will be used entirely for a repair and machine shop. There will be departments for painting and carpentering. It is estimated that it will cost to build between $25,000 and $30,000.

Welland, Ont.—The citizens, by a majority of 366, carried a by-law, on August 4, granting a stated rate of taxation to the Electric Steel and Metals Co. This company has secured property in Ward Five, signed a contract for several thousand electric horse-power, and will erect a plant where it expects to employ 250 men. No other concessions were asked. The company will melt iron and steel by electricity, making only the higher grades. Plans are being drawn for various buildings, and it is expected that construction will be started soon.

Plessissville, Que.—La Fonderie de Plessissville whose plant was burned to the ground some months ago, have built a new plant consisting of machine shop, foundry and boiler shop, paint and pattern shop. It is practically a duplicate of the old plant, and is situated near the G.T.R. station: the other was situated in the village. It measures 400 by 50 feet.

Electrical

Russell, Man.—S. D. Sparrow is the general contractor for an $18,000 electric light plant to be installed here.

Montreal, Que.—A fire in the main office of the Bell Telephone Co., July 30th, put 7,000 main telephones out of business.

St. Catharines, Ont.—On August 28 the ratepayers of St. Catharines will vote upon the question of taking a supply of Hydro-Electric power.

Vancouver, B.C.—At a meeting of the Ratepayers' Central Executive on July 21 consideration was given a campaign for the establishment of a municipal electric light and power plant. Kerrisdale Association has asked that the scheme be enlarged to include the neighboring municipalities.

Stratford, Ont.—C. T. McAllister, representing United States capital, says that the people he represents have definitely decided to build two electric roads to Grand Bend, one from Stratford and one from London. The charter for the London-Grand Bend line has already been acquired.

Toronto, Ont.—The Hydro-Electric Commission of Ontario have decided to enlarge the power house at Niagara Falls, and to double the line between Dundas and the Falls. This will provide the necessary equipment for the line between London and Dundas, towers for which are already erected. This work will cost $300,000.

Orillia, Ont.—An agreement has been reached between the Minister of Railways and Canals and the members of the Orillia Water, Light and Power Commission, under which the department undertakes to build a new dam and power house, a mile and a half below the town's present plant on Ragged Rapids. This will cost the Government $112,000. The town will provide the new machinery for 3,500 h.p., the cost of which is estimated at $70,000.

General Industrial

Sorel, Que.—Pontbriand & Son are planning to erect an automobile factory at Maisonneuve, Montreal, Que., two storeys, of brick and steel.

Quebec, Que.—The plant of the Canadian Packing Co., Fourth St., Limoilou, Que., recently destroyed by fire, will be rebuilt and new machinery installed.

Montreal, Que.—Damage amounting to between $5,000 and $10,000 was caused by a fire which destroyed the plant of the Sovereign Lime Co., on Delorimier Avenue, above the C. P. R. tracks, on July 25. A. N. Tessier, manager.

Welland, Ont.—The Empire Cotton Mills are nearly completed. The main mill is 280 feet by 120 feet, two storeys high; weave shed 231 feet by 249 feet; warehouse 350 feet by 100 feet, and several smaller buildings. Electricity will be used throughout, 1,000 h.p. being used by the motors.

Calgary, Alta.—In an effort to encourage the packing industry of the West and to centralize the business in Calgary, the municipality will probably purchase 60 acres of land adjoining the city limits and exploit a comprehensive scheme looking to the development of the meat packing industry. The city has taken an option on the land at $360,000.

Data Relative to Case-Hardening Equipment and Practice

By Frank Walker

Case-hardening of machine parts forms not the least important operation which contributes to the life and efficiency of the completed unit, whether the latter be a steam engine, a machine tool or other mechanical, electrical or hydraulic engineering product. A careful study of the information given in the article will be found instructive and profitable.

THERE are many parts of machinery at work under conditions which require that they possess great surface hardness, combined with sufficient strength to resist high torsional, tensile, or shearing strains, and to provide for such purposes no process has been found to meet the requirements so fully as that known as "case-hardening." In some instances the conditions can be met by the use of high-grade carbon or alloy steels, but in many cases, the use of these steels is not desirable, inasmuch as their high price, the difficulty of machining them and the complex heat treatments necessary to obtain from them the results required, prohibit their use in those machines which are designed to be sold in a competitive market.

The Genesis of Case-Hardening.

Case-hardening means, as the term implies, the hardening of the outer skin or "case" of the article, and in order to fully understand the process, one must go back to the earliest method of producing tool steel, and study the laws which govern it.

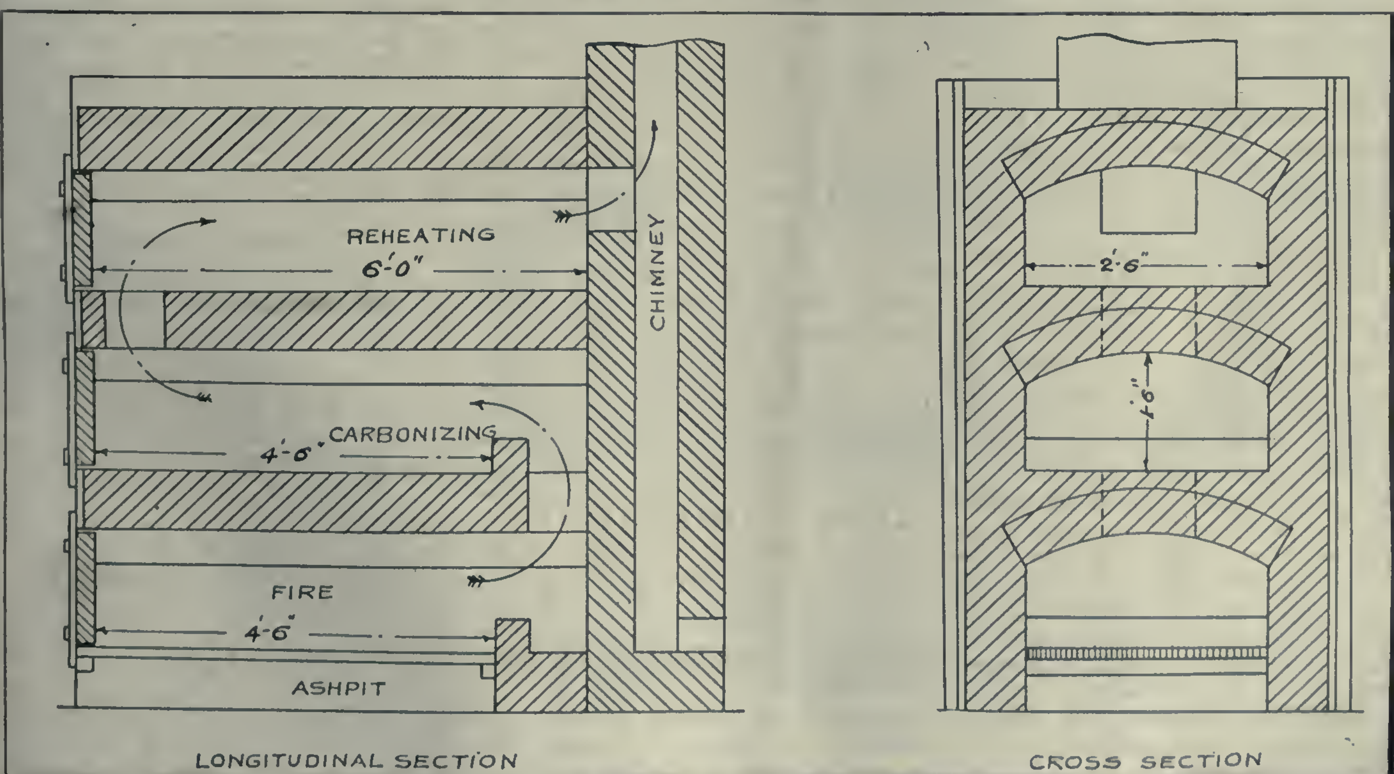
Carbon has a strong affinity for iron, and combines with it at all temperatures above 1300 deg. Fah., that is, at a dark red heat, therefore, if a piece of iron is packed in a muffle with some carbonaceous material, such as pulverized animal or vegetable charcoal, and subjected to the above or a higher temperature, it will absorb carbon in direct proportion to the heat applied and the length of time it is subjected to such an application. It must, however, be understood that temperature is the factor which governs the percentage of carbon absorbed, and time is the factor which governs the depth to which absorption takes place.

Absorption commences, of course, at the outer surface of the iron, and continues gradually inwards until the whole of the metal is carbonized, but if the temperature is held at, and not allowed to rise above, 1300 deg., the amount of carbon absorbed by the iron, even when completely saturated, will be no more than 0.50 per cent. Should the temperature be held at 1650 deg. Fah., the amount of carbon absorbed will be about 1.50 per cent., and at 2000 deg. about 2.50 per cent. These results are only obtained when the piece of iron has become carbonized to its centre, or saturated, and can contain no more carbon at the given temperature.

In the manufacture of carbon steel this process is called the "cementation process" and the resultant steel is called "blister steel." This is cut into small pieces, melted in crucibles and cast into ingots, which can be tilted or rolled into bars of the desired size. Case-hardening is actually an incomplete cementation process, for it will be seen that if the process is arrested before the action is complete, the central portions of the iron must contain less carbon than the outer, and this is the fundamental principle of case-hardening.

A Two Stage Process.

The process is completed in two stages, first, carbonizing the article to the required degree and depth, and then hardening the carbonized portions by heating and quenching. If properly carried out, it will be readily understood that an article, such as an eccentric rod pin, may be manufactured from an inexpensive, easily manipulated material possessing high resisting properties, and afterwards hardened on



CASE-HARDENING FURNACE.

its surface to resist wear, while retaining in inner portion all the original toughness of the material. Articles may be case-hardened locally by covering those portions which are required to be left soft with a coating of fire clay.

Emergency Method.

A rough and ready method of case-hardening, and one that is very useful in an emergency, is to heat the article to a cherry-red (about 1650 deg. Feh.), dust with powdered prussiate of potash, allow it to cool down to a dull red, and then quench in water. This gives but a very slight depth of hardening and should not be attempted for anything but emergency repairs.

Experience and Equipment Features.

To case-harden successfully and effectively requires considerable experience and some outlay for special appliances, but that the results will more than justify this expenditure is instanced by the fact that the process is, and has been for many years, practised by machinery builders all over the world. The appliances necessary to obtain the most satisfactory results are very similar to those required to harden and temper carbon steel, and comprise furnaces, cooling baths, pots and muffles to contain the articles to be hardened, and means by which the pots and their contents can be handled when hot.

The Furnace Equipment.

The furnace should be built on the lines of the sketch given herewith; this furnace gives good results, is easy to manipulate, and costs little to build. The lower chamber is used for carbonizing and the upper one for reheating for hardening. Its size must, of course, be governed by that of the articles to be treated, but it will be found that the dimensions given will cover a large range of general work.

A small sight-hole, about 1½ inches diameter should be pierced in each door in order to provide means of judging the temperature by the eye, and the stack should be fitted with a damper by means of which the temperature may be regulated. The quenching trough should be of ample size, and placed as close to the furnace as convenient. A sufficiency of tongs, etc., should be provided to admit of the work being handled expeditiously and also some method by which the packed pots may be charged into the furnace, and drawn from it when hot. The case-hardening plant should be housed in a separate room adjacent to the machine shop, and it should be remembered that for this class of work, ventilation is of more importance than light.

Carbonizing Pots.

The carbonizing pots may be either of cast or wrought iron, but the latter will be found to be best, for although their first cost is higher, they last far longer than the cast ones. They should be rectangular in shape, and have a plate lid fitting snugly inside. This lid or cover should have three or four ¼-inch holes drilled in it, near the centre. The pots should not be made to hold too many articles, as there is great risk of those in the middle of the charge not being carbonized to the proper depth; this, however, is one of the points which must be regulated by experience only.

Carbonizing Mediums.

The best carbonizing mediums to use for wrought iron or machinery steels containing 0.15 to 0.20 per cent. of carbon are charred leather or charcoal. The leather should be clean new cuttings and pieces, charred black and crisp and granulated till it resembles in size grated bread crumbs. The charcoal, preferably of hardwood, may be ground to a fine powder. No form of bone should be used in case-hardening, as bone contains a high percentage of phosphorus, which will be absorbed with the carbon, and have a tendency to make the work weak and brittle or as it is called, "cold short."

Packing the Pots.

Theoretically, the perfect carbonizer should be a simple and pure form of carbon, and leather or hardwood charcoal will be found to give the best and surest results. In packing the articles in the pots for carbonizing great care must be exercised, and the method should be as follows:—

First, place a layer of carbonizer in the bottom of the pot 1½ inches deep and well pressed down. Upon this, having first cleaned them perfectly free from dirt and grease, place the articles to be carbonized, with not less than 1½ inches between those on the outside and the walls of the pot, and about 1 inch between each article; then sift on carbonizer till the whole of the articles are covered to a depth of 1½ inches. Press the whole down firmly, taking care, however, not to disturb those articles already in position. Now, place another layer of articles, and continue as before, until the pot is full, leaving room, however, for 1½ inches of carbonizer between the cover and the topmost layer of pieces to be heated. The cover should then be put on and pressed down firmly, and the joint well luted with fire clay.

Through the holes in the cover 3-16 inch wires should be passed, long enough to reach to the bottom of the pot, and to stand out 1 inch above the cover, and in packing care must be taken to leave room that these wires or test rods can be pressed to the bottom of the charge without coming in contact with any of the articles. One or two small test pieces, say ½ inch round by 4 inches long should also be packed in about the middle of the charge. The pot is now ready for charging into the furnace.

The Charging Operation.

The furnace should be raised before charging to a temperature of 1830 deg. Fah. (a bright cherry red), and this temperature must be maintained with great regularity throughout the operation. The pot should be so placed in the furnace that heat can circulate underneath as well as around it, and to this end it should be allowed to rest on short cast iron or fire brick stands.

Timing the Carbonizing Period.

The timing of the carbonizing period should commence when the contents of the pot have become heated through to a full red heat, and this can be easily ascertained by means of the test wires; When it is thought that sufficient time has been given for the heat to soak through, draw a test wire by means of a long pair of tongs. If not sufficiently hot, wait awhile before drawing another wire. When the wire shows a full red throughout, time from that.

The length of time required for carbonizing depends upon the depth of casing required, and also upon the size of the articles being treated, and must be left to the judgment and experience of the operator, but, as a guide, it may be stated that a piece of wrought iron, ⅝ inch diameter will carbonize to a depth of 1-16 inch in 6 hours at a temperature of 1830 deg., and the amount of carbon absorbed will be about 0.80 per cent.

Carbonizing Completion.

At the close of the carbonizing period the pot must be withdrawn from the furnace and allowed, with its contents undisturbed, to cool down to atmospheric temperature in a dry place, the articles should then be removed and brushed clean of any carbonizer that may adhere to them.

If the packing of the pot has been properly done and no air spaces left between the contents, the articles will be found to be coated with a pure white film with occasional markings of deep blue; should they show red marking, it shows that the packing has been defective, and the deeper the red the more imperfect has been the operation.

The carbonizing having been completed the articles must now be hardened. The hardening process should be carried out with the same care as the hardening of carbon steel, for it must be remembered that the surface of the articles has now become high-grade steel with a carbon content of from 0.75 to 0.85 per cent.

In former days it was customary to dump the contents of the pot into cold water as soon as it was drawn from the carbonizing furnace. This gave satisfactory results to a certain extent, but it has been found that by adopting careful scientific methods, greater hardness of case, combined with greater toughness of core, is obtained. When hardening articles of carbon steel the following points must be borne in mind:

Pointers in Hardening.

They should be heated by radiation, and not by direct contact with the fire from atmospheric temperature to a point slightly higher than the "point of decalescence," as the critical period, when the chemical change in the carbon takes place, is called. The heating should be done evenly, and the articles should be quenched on a rising heat in rain water which should be held at a temperature of about 47 deg. Fah. Carbon steel should never be quenched on a falling heat, that is, raised to a much higher temperature than its critical point and then allowed to cool down to the right heat and quenched. If this be done, the steel, though it may be hardened to a certain extent, will be weak and brittle, showing a coarse fracture. The only excess of temperature which may be permitted should be just sufficient to insure that the change has taken place throughout the piece, and 5 or 7 degrees is ample for this.

The "point of decalescence" varies slightly with the percentage of the carbon content; the greater the percentage of carbon, the lower the temperature of the critical point, and for steel containing 0.80 per cent. of carbon, it occurs at 1465 deg. Fah. Bearing these points in mind, the hardening of the carbonized articles should be carried out as follows:—

Hardening Process.

The articles must be packed in muffles and charged for heating into the upper chamber of the furnace. They should be heated not too quickly, but steadily and evenly, to a temperature of 1470 deg. Fah.—a dull cherry red—then be drawn separately and plunged into a trough of rain water, the temperature of which should be from 45 to 50 deg. Fah. The article should not be held stationary after plunging, but moved slowly from side to side until it has become cooled down to the same temperature as the water. By following these instructions the best and surest results can be obtained. The test pieces which were packed with the charge should be hardened with the same care as the other articles, and when broken will show the depth of the hardened case.

The Test Piece Feature.

At the establishment where the writer first became familiar with the process, it was customary to pack two test pieces with each charge, one of which was hardened and broken to ascertain depth of case, while the other was filed to remove 1-16 inch of its diameter; the filings being carefully collected and analyzed for carbon content. Records of times, temperatures, depths and contents were all kept.

It may be that some readers will think that the instructions which I have given for the process are too elaborate and idealistic, but, as I have pointed out in previous papers, carbon steel is an extremely delicate material to treat, and much greater satisfaction will be obtained by careful methods, than by the old "guess and guard" processes which are practiced in many establishments, and which are more productive of misses than hits in obtaining results.

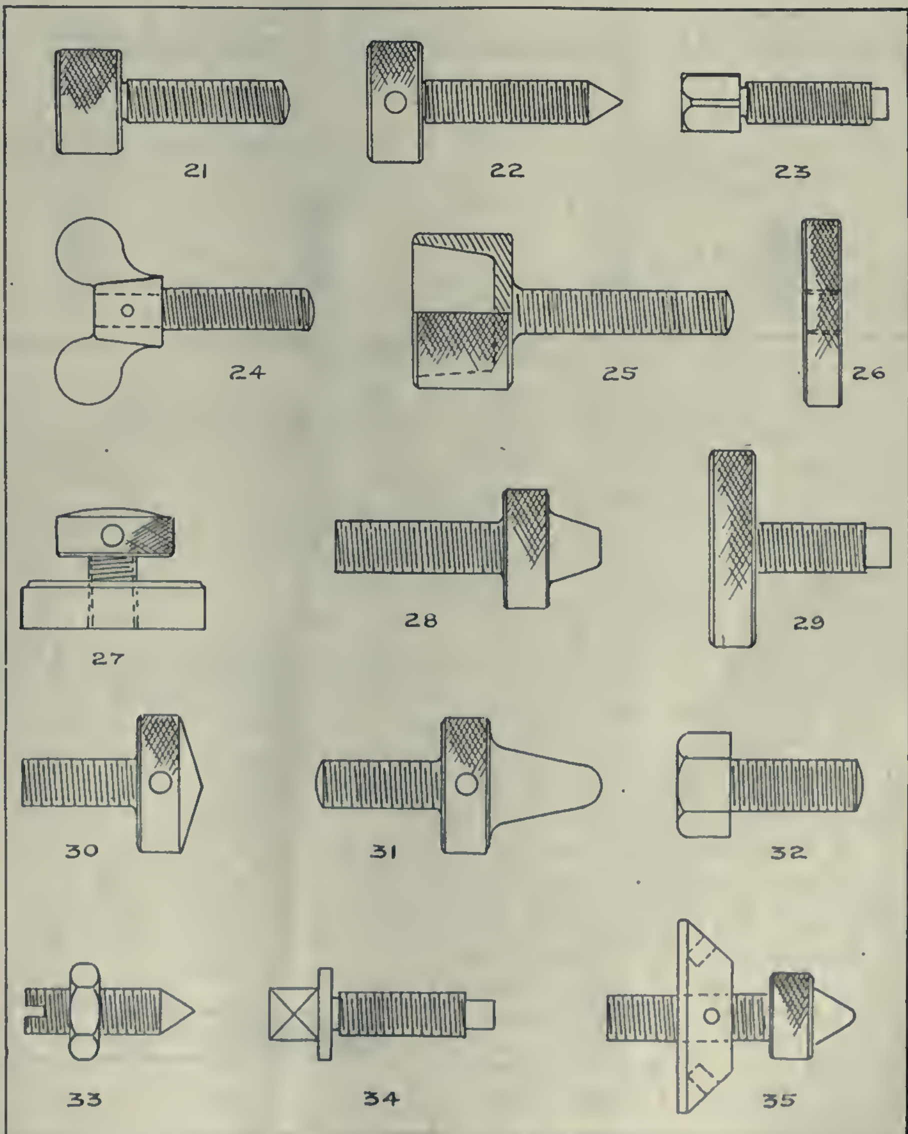
Drill Jig and Fixture Design and Construction

By H. R.

The sketches and data will, the writer hopes, appeal to machine shop superintendents, designers, toolmakers, and novices, as indicating the large place jigs of every kind and for every service occupy today in machine shop practice.

THE sketches here illustrated show different styles of screws and nuts, which are not only used for drilling jigs but are equally adapted to other jigs and fixtures.

No. 21 is very commonly used in all

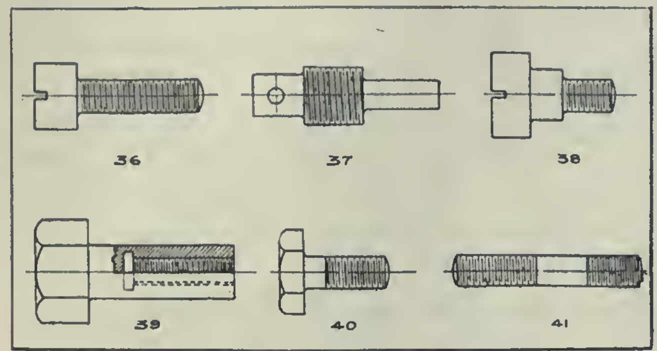


SCREWS AND NUTS FOR JIGS AND FIXTURES.

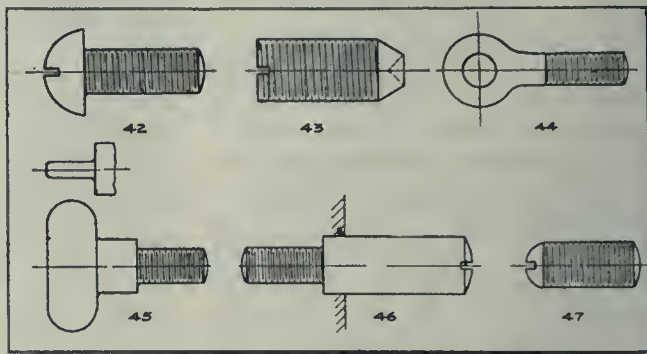
jig and fixture work where the pressure required is very slight, a stock of these being usually kept in standard sizes of 3/8 in., 1/2 in., and 5/8 in.

No. 22 is of the same type as No. 21 but has a pointed end which is good for some work, and a tommy bar hole enables additional pressure to be put on.

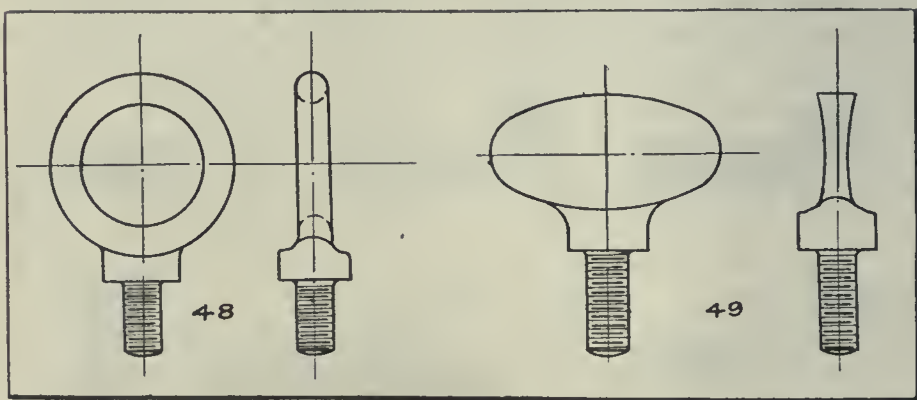
No 23 shows a common square headed set screw with a flat pivot-ended point.



SCREWS FOR JIGS AND FIXTURES.



SCREWS FOR JIGS AND FIXTURES.



SCREWS FOR JIGS AND FIXTURES.

This is used where the space for holding down the work is limited, and it would be impossible to have a projecting head.

No. 24 is a made-up wing screw. It will be observed that any size shank can be pegged into a wing nut to suit the particular job, and some nut and bolt manufacturers make a speciality of supplying these in drop forgings. Of course the wing nut can be adapted to quite a few different jobs.

No. 25 depicts a lightened out screw for very fine or light work.

No. 26 shows a very suitable locking nut that can be used on most of the screws shown in this article.

No. 27 is a combination of a screw and base plate with tommy holes, being used for jacking or levelling up work on jigs and fixtures. This is especially adapted for plate jig work where the piece to be operated upon only requires a small plate jig to do some particular hole, and where a large jig is unnecessary.

No. 28 is a screw for binding purposes, also No. 30 which has a conical top and tommy holes.

No. 31 is of the same principle as No. 28, but with a long round nose end and tommy holes.

No. 29 is of the same design as No. 21, but it will be noticed that it has a large diameter head for extra leverage, and is made rather thin so that it is suitable for jigs that have to be drilled on all sides. This means that the screws have to be as short as possible on the overall length, while the feet on the jig are at their minimum depth.

No. 32 is the commonest of all screws, but universally used in jigs and fixture work.

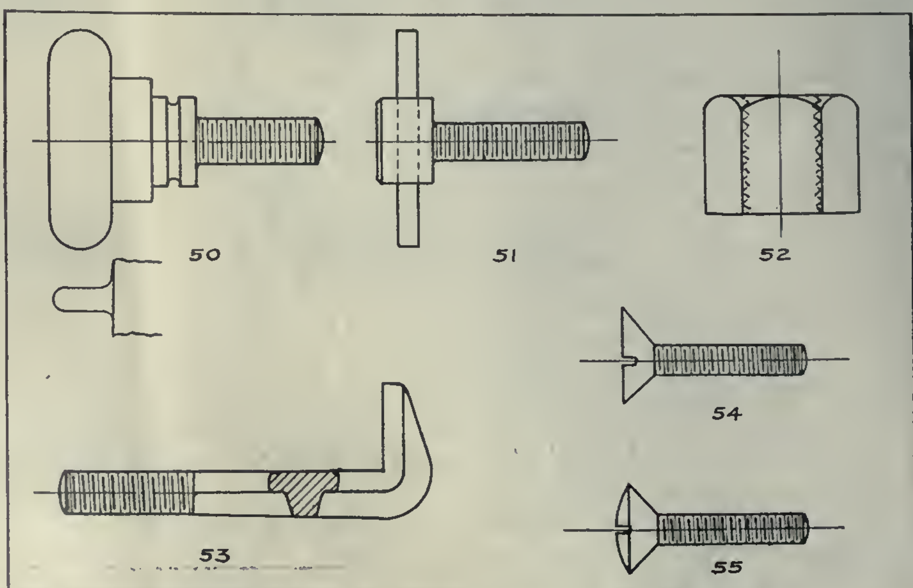
No. 33 is a locating point headless set screw, and is used for a locating point that will need possible adjustment, being afterwards locked up for a permanent point by the lock nut.

No. 34 is a flange headed set screw, and its use will be better appreciated by a sketch in a following contribution.

No. 35 is a very useful type of binding screw and lock nut. It is especially adapted for working in very close places, and enables the lock nut to be screwed up easily. The face of the nut is set on an angle, being better than on the periphery, and, if necessary, the face of the screw can be made the same way.

Binding and all screws should be made in various sizes and with threads to conform to the standard taps with which the shops are provided. When drills of a very large size are used, a screw with a hexagon or square head is best, as the work requires firm clamping. If the drills used are small, the winged nut or screw or the screws which are simply screwed up with the fingers will be sufficient and more convenient, as they will require less time to manipulate.

No. 36 shows a fillister headed screw. This is very largely used in built-up jig work for screwing plates together. The heads are very often sunk flush with the top of the plate.



SCREWS AND NUTS FOR JIGS AND FIXTURES.

No. 37 shows a useful plug screw, the long shanked end being ground to the size of the hole in the work for which same is intended.

No. 38 is a fillister headed screw with a shoulder. This is used mostly in swing straps where there has to be a certain amount of clearance to allow for swinging these straps, and yet not unwind the screw.

No. 39 is a special nut which can be used to advantage where the stud has to be very short, yet obliged to get down to the work.

No. 40 is a thin-headed set screw used for slot work.

No. 41 is the common screwed stud.

It may be mentioned that to screw a stud into a casting permanently, and holding down the work by a nut is much better than screwing a set screw into a tapped hole. This means that if the threads of a tapped hole get worn by constant use, same will have to be tapped out to a large size to accommodate a larger screw. If a stud be used, and the threads get worn, it simply means that a fresh stud can replace the old one of the same size, or a new nut as the case may be.

No. 42 is a round-headed cap screw which is used in place of the fillister head when same cannot be sunk into the metal.

No. 43 shows a cup-point headless screw, useful for centering work.

No. 44 is an eye swing bolt largely used with winged nuts and where it is necessary to swing the clamping bolt out of action. This means the saving of a lot of time unscrewing the whole length of the thread.

No. 45 is what is termed a locking jig screw, and is used in conjunction with slotted clamps to be shown later.

No. 46 is a plain-shanked screw, and the illustration shows the best way of setting into the casting.

No. 47 is another type of binding screw very commonly used, while No. 48 shows an eye bolt. These will be appreciated by operators where the drill jig is very heavy. By putting one or more of these into a jig, it can be readily moved about without a lot of trouble.

No. 48 shows another type of thumb or wing screw, while No. 50 is a screw very commonly used for the moving of various wedges to be described later.

No. 51 shows a screw with the tommy bar a fixture.

No. 52 is a nut which it will be noticed is rather thicker than the usual standard. This is for very heavy work such as the clamping of big castings.

No. 53 shows what is termed a hook bolt, but should not be used where it is possible to put a better bolt. If it be used, the back should be backed up so as to prevent possibility of the bolt springing from its work.

No. 54 is a common type of countersunk screw, adapted for screwing down thin plates.

No. 55 is the French-headed screw, but very little used in jig work.

The World's Metal Production, Consumption and Stocks

The "Engineer"

The return which is now made for the nineteenth year, states that the consumption of metals in 1912 underwent such a large augmentation in general, that it was temporarily impossible for the production to keep step with the demand, notwithstanding the considerable expansion in the output.

ATTENTION is drawn to the well-known statistics issued by the Metall Gesellschaft of Frankfort-on-the Main regarding the production, consumption, and stocks of copper, tin, lead, zinc, and other metals.

Copper Production.

The return shows that the production of copper throughout the world in 1912, exceeded 1,000,000 tons for the first time in history, the quantity having been 1,019,800 tons, as compared with 893,400 tons in 1911. The figures represent an increase of 14 per cent., whereas those for 1911 only experienced an advance of 6 per cent. over the preceding year. As to the distribution of the tonnage among the different countries, it is mentioned that a considerable extension of the production took place in America, the North and South of which yielded 707,900 tons for the market, or 69.4 per cent. of the world's output. This quantity was 93,000 tons in excess of 1911.

The chief share of the increase devolved upon the United States, where the copper works produced 592,400 tons, as contrasted with 518,700 tons in the preceding year, the mines output alone being 563,800 tons, or 14 per cent. more than in 1911, so that these mines provided 55 per cent. of the world's production. The augmentation applied to a large extent to the new mines in Arizona and New Mexico, while the output in Utah and Nevada was largely hampered by labor troubles.

The imports of raw copper, and the native production combined, totalled 730,900 tons, as against 639,300 tons in 1911, which were delivered to the refineries for treatment, but according to the United States Official Statistics, the output of refined copper amounted to 717,600 tons, as compared with 649,500 tons in 1911, the former being equal to 70 per cent. of the world's production; 584,400 tons of the quantity were electrolytic copper. It is expected that the unrest in Mexico will prejudicially affect the development of the output of copper in the present year, but the forthcoming opening of the Panama Canal will be conducive to the advancement of the working of the deposits of ore in South America, in which an increasing interest continues to be shown.

The production of raw copper in Europe is returned at 197,000 tons for 1912, as contrasted with 181,500 tons in 1911. Russia is credited with 33,000 tons of this total, as against 26,600 tons in the previous year, and a further advance is considered probable. The exports from Spain were 23,300 tons, as compared with 18,300 tons, the increase mainly concerning the Rio Tinto mines. Germany produced 39,800 tons, as against 37,500 tons; and Great Britain 63,200 tons, as contrasted with 67,700 tons in 1911. This represents a further decrease for Great Britain, which occupied the second place among the raw copper-producing countries until last year, when the position was secured by Japan. The output of the latter country rose from 55,000 tons in 1911, to 67,000 tons last year, and that of Australia from 40,000 tons to 44,900 tons in the two years respectively, but the hopes entertained with regard to the development of the copper deposits in the Katanga district of the Congo have hitherto not been realized.

Concerning the world's consumption of copper, the return gives the total at 1,040,000 tons, as contrasted with 953,700 tons in 1911, and as the former was much greater than the output, the world's stocks had to be drawn upon to the extent of about 21,000 tons.

Lead Production.

The world's production of lead, which next receives the attention of the return, and which remained almost stationary in 1911 in relation to the previous year, increased from 1,132,000 tons in 1911 to 1,189,100 tons last year. Of the European countries, Spain was responsible for exports of 186,700 tons in 1912, as compared with 175,100 tons; Germany produced 165,000 tons, as against 161,300 tons; Belgium, 57,100 tons and 44,300 tons; France, 33,000 tons and 23,600 tons; and Great Britain, 29,000 tons and 26,000 tons in the two years respectively. The leading position was sustained by the United States with 388,700 tons, as contrasted with 377,900 tons, Mexico apparently ranking second with 120,000 tons, as against 124,000 tons in 1911. On the other hand, the world's consumption of lead reached 1,198,000 tons in 1912, as contrasted with 1,157,700 tons in 1911, and the inadequate supplies, in face of the urgent demand, caused a large decrease in stocks and forced prices to such a high level as has not been recorded since 1873.

Tin Production.

The increase in the production of tin from 118,700 tons in 1911, to 123,100 tons in 1912, almost entirely devolved upon the Straits Settlements, which raised 61,528 tons in 1912, as compared with 57,944 tons in the previous year, whilst Bolivia occupied the second position with ore equivalent to 23,000 tons of tin, as contrasted with 22,200 tons in 1911. On the other hand, the world's consumption advanced from 120,600 tons in 1911, to 128,100 tons in 1912, only 2,400 tons of the increase applying to Europe. Germany participated to the extent of 21,700 tons, as against 19,300 tons in 1911; Great Britain consumed 21,500 tons, as compared with 21,900 tons; whilst the United States had a share of 51,700 tons, as contrasted with 48,000 tons in 1911. The augmentation in the latter case is attributed to the large expansion in the American export surplus of tin-plates—83,200 tons, as against 62,400 tons in 1911—to the detriment of the British export trade.

Zinc Production.

In the case of zinc, the production is returned at 977,900 tons in 1912, as compared with 902,100 tons, whilst the consumption amounted to 987,500 tons, as against 903,206 tons in 1911. The following tables show the production, consumption, stocks, and average prices in the past three years, and the respective consumption of the four leading countries:—

Production, Consumption, Prices and Stock.

COPPER.	1910. Tons.	1911. Tons.	1912. Tons.
Production in tons .	887,900	893,400	1,019,800
Consumption in ton..	913,700	953,700	1,040,200
Average price	$286	$280	$365
Stocks in tons on January 1st	148,500	102,100	83,400
TIN.			
Production in tons ..	115,700	118,700	121,300
Consumption in tons.	119,600	120,600	128,100
Average price	$776	$962	1,047
Stocks in tons on January 1st	20,300	19,580	14,150
LEAD.			
Production in tons ..	1,128,500	1,132,900	1,189,100
Consumption in tons.	1,116,400	1,157,700	1,198,900
Average price	$65	$70	$89
ZINC.			
Production in tons ..	816,600	902,100	977,900
Consumption in ton.	827,000	903,200	987,500
Average price	$115	$126	$131

Consumption of the Four Principal Countries.

LEAD.	1910. Tons.	1911. Tons.	1912. Tons.
Germany	210,400	229,800	220,500
United Kingdom	208,400	198,300	196,100
France	89,800	99,600	106,500
United States	378,900	365,200	397,800
COPPER.			
Germany	209,400	222,100	232,700
United Kingdom	146,000	159,200	144,700
France	85,700	95,700	99,800
United States	339,900	321,900	371,800
ZINC.			
Germany	134,500	219,300	225,800
United Kingdom	177,800	175,700	185,200
France	56,300	82,000	82,000
United States	244,500	251,000	312,400
TIN.			
Germany	18,200	19,300	21,700
United Kingdom	19,400	21,900	21,500
France	7,330	7,400	7,500
United States	49,900	48,000	51,700

The output of nickel throughout the world in 1912 amounted to 28,500 tons, as contrasted with 24,500 tons in the previous year, the United States and Canada having been jointly responsible for 15,000 tons and 12,000 tons in the two years respectively, and the average price remained at 80 cents per kilogramme as in each of the three preceding years. A further development took place in aluminum, the output of which reached 61,100 tons, as compared with 45,000 tons in 1911.

The first position is occupied by the United States and Canada, which produced 18,000 tons, as in 1911; France turned out 13,000 tons, as against 10,000 tons; and Germany, Austria, and Switzerland are credited with 12,000 tons, as contrasted with 8,000 tons in 1911. It is calculated that the world's consumption amounted to 61,100 tons, as compared with 46,800 tons in 1911, and 28,000 tons and 20,900 tons in the two years respectively apply to the United States. The average price was 36 cents per kilogramme, this contrasting with 28 cents in 1911 and 35 cents in 1910. In conclusion, the statistics record the production of quicksilver at 4,300 tons, or 200 tons in excess of the previous year, but the figures for silver are not available for 1912.

LENGTH OF LOCOMOTIVE BOILER TUBES.

WHILE no one argues that increasing the length of tubes adds to the steam generative capacity of the boiler in anything like corresponding proportion, there are few engineers, says a writer in the Railway News, who go so far as to claim that, beyond a certain length, the value is almost negligible. A record of experiments conducted at the Altoona testing plant of the Pennsylvania Railroad, recently made public, gives some interesting data concerning the matter.

The temperature observations indicate that the gases entering the tubes are of a lower temperature than is shown by a separate pyrometer placed in the middle of the fire-box. The fire-box temperature ranges from 2,000 to 2,400 degs., while the temperature at the tube ends is from 1,370 to 1,620 degs. They also show that there is a rapid decrease in temperature for a distance of 3 ft. or 4 ft. in the tube, after which the temperature drop is much more gradual, but even with short tubes only 13 ft. 8⅝ in. long, the temperature curve becomes flat towards the end of the tube, indicating that a large part of the heat is absorbed before half the length of the tube is reached.

ELECTRIC WELDING IN LOCOMOTIVE SHOPS.

ELECTRIC welding has been most successful in the locomotive workshops of the Erie Railway. There are eight machines in operation ,and 60 per cent. of the work is on boilers. According to the Railway Gazette, cracks of all kinds in boilers can be welded by this system, and it is the practice to heat up the plate by means of steam on the inside of the boiler before beginning operations. The opening to be filled with welding material is extended clear through the plate and an open space left at the bottom. The weld is carried to a thickness ⅛ in. greater than the plate, and it is very important that the welding material be hammered while hot, and the more promptly this is done, the better the results. There are over thirty full sets of boiler tubes welded to the tube plates in locomotives belonging to the railway referred to, in addition to many partial sets.

The method following on this operation is to set the copper ferrule 1-32 in. back from the edge of the plate, roll it and insert the tube, letting it project 3-16 in. beyond the plate, or ¼ in. in the case of superheater tubes, and after again rolling lightly, weld round the extension and to the plate. After the welding is finished, the work is smoothed off by a special tool and gone over lightly with a beading tool. In welding patches on the side plates of a fire-box, longitudinal seams are generally satisfactory, but vertical seams usually fail after two or three months. The welding of tubes is not advisable in bad water districts on account of the increased difficulty in removing them at frequent intervals.

The Theory and Practice of Screw Cutting on the Lathe

By J. Davies

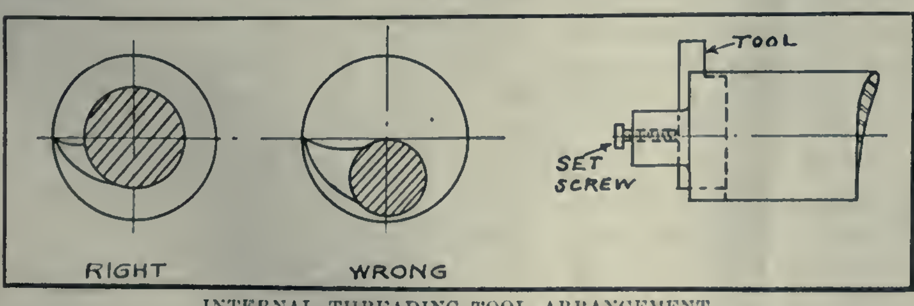
The author of this series of articles intimates his intention of making the information sufficiently simple and clear, that apprentices and others with only the four rules of arithmetic at their command will be able to intelligently grasp the data and apply it in practice.

IN cutting left hand threads the direction of the travel of the tool is generally reversed, either by the reversing quadrant at the end of the lathe, or, if the lathe has no reversing quadrant, by inserting an extra gear in the train of wheels. This is no doubt the best method for shafts, rods, etc., but for some other work it is open to serious objection; for instance, the cutting of a left hand thread inside a long sleeve can best be done by reversing the lathe and commencing the cut at the same end as you would for a right hand thread.

The advantage of the latter is that the lathe hand can see how the tool is operating before it has time to do any damage, in case he should happen to put the nut in gear at the wrong place—a thing that every lathe hand does sometimes. Before I got on to this idea, I saw a man cutting a fine thread in a long brass bush. He happened to put the nut in at the wrong place, and when the tool emerged at the other end the job was spoiled. The above method obviates anything of that kind. When fixing the chuck for a job of this kind, bang it on a little harder than usual, as the cuts tend to unscrew it from the end of the lathe spindle. I have never known this to occur, but it is best to take no chances.

Internal Threading Tools.

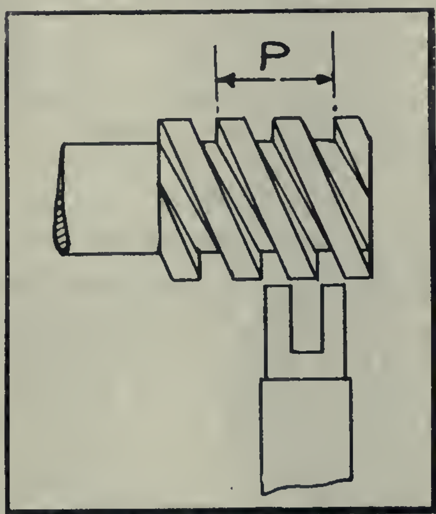
Every mechanic knows that the difficulty experienced in cutting a long, small internal thread is due to the spring of the tool, and, while the ob-



INTERNAL THREADING TOOL ARRANGEMENT.

vious thing to do is to make the tool as stiff as possible in the round part or shank, yet, strange to say, nine out of every ten operators do not take this into consideration in making or grinding their tools. The cutting edge of the tool in question must be somewhere near the centre of the hole, and if the cutting edge of the tool is in line with the top of the shank it follows that the whole of the tool must be contained in half the diameter of the hole. If the cutting edge of the tool is in the centre of the bar, as it should be, it allows of a much stiffer tool being used.

In cutting an extraordinarily long hole, it may be necessary to make a boring



TOOL FOR COMPOUND THREAD.

bar, fasten a tool in by a set screw from the end and push out the tool a little at every cut. If the bar is nearly the size of the hole, it will prevent the bar from springing, but the end of the bar must be reduced past the cutting edge so that the bar will push the cuttings before it. Since it will be impossible in most cases to remove the tool for the return stroke, if there is any slack or backlash in the leading screw, care must be taken of this by the hand.

Cutting Compound or Multiple Threads.

The usual method employed in cutting compound or multiple threads is to put a wheel on the lathe spindle, whose teeth can be divided by the number of threads we wish to cut, then by marking off the teeth, and lowering the quadrant and turning the lathe round, we can make the number of divisions required. A compound triple or four-start thread can, however, be cut by taking alternate cuts up each thread, without dropping the quadrant, and turning the job through a certain portion of a revolution, or otherwise marking off or measuring the space between each cut when the screw to be cut complies with the following conditions:—

When the thread on the screw to be cut is rougher than the leading screw, and the number of complete revolutions of the leading screw to one revolution of the job or face plate is equal to or a multiple of the number of starts we wish to make, bring the lathe carriage back to the same place every time, and mark off on the face plate as many divisions as you wish to make starts or separate threads. For the first cut, engage the nut when division No. 1 on the face plate is at the top, and the next cut when division No. 2 is at the top, and so on. If it happen, which is often the case, that a compound thread is to be cut whose pitch fulfils the conditions laid down, this is by far the most convenient method.

A compound thread can also be cut at one operation with a tool filed up to suit, provided that the job has sufficient clearance at the end of the thread to accommodate the increased width of the tool. See Upper Figure.

INDUSTRIAL ALCOHOL FOR FUEL.

INDUSTRIAL alcohol can, it is stated, be produced from the refuse of the sugar factories at Demerara at 8 cents per gallon. In addition to sugar, maize is said to be rich in carbohydrates, which yield the highest percentage of crude alcohol. Maize contains 70 per cent. of carbohydrates. Engines constructed for kerosene can usually work with alcohol without any adaptation, and the storage of alcohol is much less dangerous than that of petrol. Alcohol, however, has not the same value per horse-power as petrol, 1.8 times as much being required.

MONTREAL AND TORONTO PUBLIC UTILITIES.

SOME interesting figures have been compiled at the City Hall, Montreal, in regard to the number of Public Companies there, which contribute to the civic exchequer, compared with the number of companies, etc., in Toronto.

There are fifteen of such companies in Toronto, compared with eleven in Montreal. The figures in both instances show just what assessed values are levied on the companies for buildings, land, plant in streets, rails and poles. In some cases, the business tax is also included in Toronto, but in Montreal it is not shown in the total assessments. as the method of levying the business tax is not given under the heading of assessment on property.

Toronto Data.

The following list shows just what companies were taxed in Toronto last year, and the total amount of assessed values in each case:—

Street Railway Co., $2,886,665; Consumers' Gas Co., $4,109,690; Toronto Electric Light, $1,947,918; Bell Tel. Co., $1,663,869; C.P.R. Telegraph Co., $121,042; G.N.W. Telegraph Co., $76,220; Grand Trunk Railway, $5,000,283; Toronto and York Radial Railway Co., $90,632; Toronto and Suburban Ry. Co., $31,400; Inter-Urban Elec. Co., $13,746; Toronto & Western Ry., $2,900; Erindale Power Co., $505; C.N.O. Ry., $199,116; Canadian Pacific Railway, $3,913,693; Toronto & Niagara P. C., $989,797.

Montreal Data.

In Montreal the public companies and the assessed values are shown as follows:

Montreal Tramways Co., $4,301,155; Grand Trunk Ry., $6,994,100; C.P.R. and Ont. & Quebec Rys., $12,388,855; Canadian Northern, $522,400; Lachine, Jacques Cartier & M. Ry., $103,900; Light Heat & Power Co., $3,757,750; Canadian Light & P. Co., $172,400; Sagarguay Elec. Co., $107,300; Shawinigan Water & Power Co., $42,500; Montreal Water & Power Co., $1,689,800; Bell Telephone Co., $2,256,650.

It will be noted that, while there are fewer public utility companies in Montreal than in Toronto, the last assessments of most of them are far larger than is the case in the Queen City.

SHUMAN'S SUN-POWER ENGINE.

IN a previous issue, attention was drawn to a sun-power pumping plant installed in Egypt.

The principle of this invention of Mr. Shuman's latest system of power-production, says a writer in the Daily Telegraph, is simple, the heat of the sun being used to raise steam in a specially constructed boiler, which steam drives a low-pressure engine. There is a series of generators, each consisting of a flat sheet-iron box, 3 ft. square, with plates only ⅛ in. apart, and covered by two sheets of glass an inch apart. The boxes are massed together over a space of 5,000 square feet, and have a heat-collecting area of about 10,300 square feet. The boxes are placed on trestles, and can be set at angles to suit the sun, whilst mirrors are used to direct additional sunlight on to the boilers.

The steam pipes from the various boxes are connected together, so that they discharge into a large pipe, 8 in. diameter, which conveys the steam to the engine. The latter is a low-pressure machine, designed specially to reduce heat losses to a minimum. It is provided with a tubular surface type condenser, which type is essential, as only distilled water can be used practically in the generators.

BLUE-BLACK FINISH.

TO obtain a blue-black finish on small steel parts, use a mixture of 16 parts by weight of saltpeter, and 2 parts black oxide of manganese. This is heated to a temperature of 750 degrees F., and the objects are immersed in it. The finish is "built on" to the metal, so that if the work is round, for example, the diameter is slightly increased. The oxide of manganese is deposited on the work and must, therefore, be frequently replenished in the mixture.

SPANISH RIVER PULP AND PAPER CO.

IN a memorandum issued showing the general position of the Spanish River Co.after the absorption of the Lake Superior Co., it is stated that the output from the three plants, as at present equipped, is approximately 140,000 tons of newsprint per annum. The various mills are now operating up to full capacity, which is as follows:—

	Tons Per day	Tons Per year
Espanola Mill	170	50,000
Sault Ste. Marie Mill..	230	70,000
Sturgeon Falls Mill ...	60	20,000
Total paper	460	140,000

On the question of earnings the memorandum says:

Part of the paper mill at Espanola commenced operations in June, 1912, and the remainder in July, 1913. The mills at Sturgeon Falls commenced operations in January, 1913. All the mills are on a proper operating basis as from July, 1913. The paper mill at Sault Ste. Marie is entirely new. The last of its four machines was not put in operation until April, 1913.

PAGE-HERSEY CO. AND SCOTT ACT.

Dear Sir,—In regard to the proposed Scott Act measure, we would like to put ourselves on record as being opposed to the Scott Act, and in favor of the strict enforcement of the present License Act.

We are of opinion that should the Scott Act be passed in Welland it would tend to keep skilled labor, for which there is always a demand, away from Welland, and make it hard for us to hold the men who are now here. In other words, the working men, who have no vote on the question, and who are greatly in the majority, will object to having their liberty taken away from them, and leave Welland, which would greatly hinder us in putting our product on the market.

In conclusion, we would say that we have not experienced any trouble through our men being intoxicated, and believe in letting well enough alone.

Yours truly,
Page-Hersey Iron Tube
and Lead Co., Ltd.
Per A. M. Mosley, manager.

SUPERHEATING STEAM.

IT is well known that steam can be superheated by the heat released during pressure reduction, but it is generally considered that such a method is extravagant, though interchange of heat in the same way occurs to some extent in ordinary working in consequence of wire drawing or throttling.

According to the Railway News, an arrangement including this feature has been designed for locomotive engines. Steam is superheated in passing through a valve placed in a casing alongside the steam dome, and in the path of the steam from the dome to the smoke-box, this valve being regulated to maintain a predetermined constant reduction of pressure. The valve comprises a series of pistons of graduated diameters and controlled by an adjustable spring. After passing this valve, the steam enters a smoke-box superheater consisting of a series of tubes connecting with side headers, from which it may be assumed that the superheat obtained by pressure reduction is not a very valuable factor taken by itself.

To assist the smoke-box superheater, small tubes are placed in some of the boiler tubes, so as to conduct some of the furnace gases directly to a casing surrounding the superheater.

Economies in the Installation of Electric Power

By W. E. Milne

The question of the most suitable power with which to operate our factories and workshops is one of large interest to those responsible for their management and in no less degree, does it concern the power plant operator. Expressions of opinion from those particularly interested in any phase of the subject are therefore necessarily instructive and valuable.

THE author acknowledged at the outset that the electric motor is not suitable for every class of work. There were, indeed, many instances in which its use might be advisable from an engineering point of view, but wherein it could not prove a commercial success. Technical knowledge and practical experience were essential to determine these cases. He was strongly of opinion that the commercial canvasser who, lacking any technical knowledge, possesses those qualities of salesmanship which enable him to get motors into consumer's premises, is a dangerous person to employ. Such a person, he said, is not able to discriminate between those jobs which are suitable and those which are ill adapted for the electric drive. Again, a number of the installations secured by him, even if not altogether unsatisfactory, are to a great extent spoilt through lack of engineering arrangement.

Technical Advice Necessary.

The author strongly emphasised the importance of technical advice in arranging an electric drive. He said that electric motors are too often installed on the advice of commercial assistants, or others possessing little or no electrical knowledge, and the results are lamentable, a shunt motor being recommended in all circumstances and for all purposes.

Considering the many types of electric motors and the great variety of control gear, he said, it is a pity that the shunt motor with an ordinary starting switch is apparently used on every possible occasion. A commercial engineer with technical knowledge should find no difficulty in inducing a reasonably-minded consumer to obtain, at slightly greater expense the type of motor or control gear which will give the maximum efficiency and the greatest convenience, and which will not only cover his requirements, but will also give many advantages not found in the usual installation.

Technical knowledge is also essential in handling alternating-current work. Unfortunately, in many cases, the engineers handling power installations display a lack of knowledge of the various forms of electrical apparatus which may be brought to the notice of manufacturers. The blame for the majority of unsuccessful installations of electric power should, however, rest on the shoulders of mechanical engineers rather than on electrical engineers.

The author thought that in considering the matter of economies, far too much importance is generally attached by power users to the actual cost of power, and it was also difficult to get a manufacturer to realise the many considerations which are put forward when comparing estimates for the cost of driving.

We are all familiar, he said, with the gas engineer's somewhat crude method of comparison between gas and electric driving. The power user is usually told that, say, a 10-h.p. gas engine takes 20 cubic feet of gas per horse-power-hour. On a 50-hours per week basis this works out at 10,000 cub. ft. of gas, which if charged at 36 cents per 1,000 cub. ft., equals $3.60. On the other hand, the customer is told that a 10-h.p. motor consumes approximately one unit per horse-power-hour, which is equivalent to 500 units per week. Taking current at 2 cents per unit, he is thus shown that the electric motor would cost $10 against $3.60 for a gas engine.

Having commented upon the unreliability of such comparisons, the author suggested that a method of estimating the cost of driving based on figures actually obtained from existing manufacturers' installations gives a common-sense and accurate comparison. Such a method, he contended, is practical, and the figures can be backed by the evidence and results obtained from several years' working on various drives.

Load Curve Comparison.

Another method of comparison which appeals to a manufacturer with an elementary knowledge of engineering, is to obtain load curves for the steam engines by means of continuous recorders, or from electric motors by means of recording ammeters, and to submit such curves to a power user.

The owner of a mill, which was steam driven, assured the author that the large number of rolls on his engine resulted in a practically steady load, so that the engine was worked at a very high efficiency throughout its run. He argued that under such conditions electricity could not compete with steam engines on the ground of cost. A continuous indicating diagram, however, showed that his load varied from 70 to 215 h.p., and a glance at the curve on the diagram secured, would convince any engineer that on such a load, the maximum efficiency cannot be obtained by steam driving.

Electrical Factory Labor.

In the concluding portion of his paper, the author presented an argument which he said unfortunately was not generally accorded the consideration it merited. This was that the conditions of labor and employment in electrically equipped factories are usually far superior to those found in works utilising any other form of power.

"It has been considered necessary for the well-being of labor," said Mr. Milne, "to enforce certain laws governing the lighting, ventilation, heating, and cleanliness of workshops and factories. It is safe to say that if electric power were universally used, and if no steam or gas were found in factories, these laws would rarely have been necessary. Practically in no case is steam or gas called in to improve the lighting, cleanliness, or ventilation of works. The introduction of electric power invariably gives better working conditions, and although these arguments may be somewhat advanced, there is no doubt they should be taken into consideration when considering the equipment of works and factories."

From a paper read before the Birmingham local section of the Institution of Electrical Engineers.

THE UNION OF GERMAN MACHINE-TOOL MANUFACTURERS.

AT a recent meeting of the Union of German Machine-Tool Manufacturers in Berlin, says Engineering, a report was read dealing with the state of the machine tool industry. According to this report, the position of the trade, which had shown some slight improvement in 1910 and 1911, had continued to develop satisfactorily during 1912. This was made manifest both in an increase in the number of hands employed and in a pronounced expansion in the export trade. The position in the machine-tool industry was thus in keeping with the tendency of trade in general.

The effect of the increased demand, and of the wars of last year had, however, caused a rapid rise in the price of raw materials, of wages, and of general costs of every description. Prices obtainable in the machine-tool industry were still depressed, notwithstanding numerous orders, and only in some branches had it been possible, by means of combines, to secure prices corresponding to the enhanced cost of production.

Added to this, the unsettled political conditions had resulted in orders being withheld, so that the trade with difficulty secured orders on a scale corresponding to its increased capacity. Even if the orders at present in hand were considered to be sufficient, the business situation could not become thoroughly satisfactory and sound until the political outlook had cleared, and the difficulty of shortness of money, which greatly impeded the industry, had been got over.

Attention was drawn to the fact that the competition between the machine-tool manufacturers not only resulted in lowering prices, but also had an unfavorable effect upon the manner in which payments were made. Reports from the different branches bore out this assertion. With the increase in the turnover, prices were shown to have fallen.

Increased Activity Feature.

The general increased activity was, in the first instance, due to the growing home demand, although exports had also increased satisfactorily. It was a notable circumstance that, in the case of machines which were manufactured in large quantities, the manufacture of which necessitated no special experience, export prices were slightly above those of the home market. For special tools, German makers were able to obtain very good prices in foreign markets.

When statistics were looked into, it appeared, as had been shown to be the case before, that the benefit of improving trade affected the German machine-tool industry much later and to a much smaller extent than it did other industries. One of the chief reasons for the disproportion between the satisfactory employment returns, and the unsatisfactory prices obtained, was to be found in the fact that numerous machine manufacturers, owing to inadequate methods of fixing costs and to erratic calculations, submitted tenders at figures which were much too low, and allowed them to be reduced to a level of prices which excluded all profit. It was, therefore, again necessary to lay stress upon the need of better arrangements for costing and estimating.

The terms of payment which the customers had forced upon the machine-tool manufacturers had simply resulted in the buyers being enabled to extend their works at the expense of the machine manufacturers, payments being made only out of the increased subsequent profits, and taking place therefore long after delivery. The same practice seemed to be finding its way into the foreign trade. The custom of insisting upon alterations in constructive details without additional remuneration was having a bad effect. The competition which existed was also used by the buyers as a lever for obtaining more stringent conditions of delivery and compensation. This was the case with orders both from the State and municipalities, as well as private buyers, who all tried to tie the manufacturer down in every way. In order to check this tendency, the Union strongly impressed upon its members the necessity of abiding by the delivery conditions framed by the Union, which do full justice to the buyer.

CASTING COPPER.

As is well known, it has been found practically impossible to cast copper which is mechanically sound and of high electrical conductivity, on account of the porous metal that is obtained. By an addition of boron, according to the author of a paper read recently before the American Institute of Metals, this can be accomplished. Boron has a high affinity for oxygen, nitrogen, and oxygen-containing gases, which cause the difficulty in copper casting. On the other hand, boron has no affinity for copper, and is therefore a good deoxidiser for the metal. One per cent. of boron suboxide flux—equivalent to 0.08 to 0.1 per cent. of boron suboxide—is added to the copper, and a casting that is commercially sound is obtained. Owing to this new development, the author states, cast copper is rapidly replacing forged copper in many electrical applications. The advantages derived from the use of cast copper are the saving of cost and the elimination of a number of joints, which are always a source of loss in efficiency.

CANADIAN MAGNETIC IRON SANDS.

G. C. MACKENZIE, in a report issued by the Canadian Department of Mines, gives an account of his investigation of the magnetic iron sands of Natashkwan, Que., of which there are deposits at various points along the north shore of the lower St. Lawrence River and Gulf. In their native condition they are unfit for the production of iron, and can be made so only by concentration.

The best means of accomplishing this has been demonstrated to be the wet magnetic separator of the Grondal type. Crude sand containing 14.7 per cent. iron and 4.43 per cent. titanic acid can be concentrated to a product containing 70.4 per cent. iron and 1.7 per cent. titanic acid, recovering, however, only about 45 per cent. of the original iron. Better adjustment of the separators and closer attention to details are thought likely to improve these figures. Details are given of a plant and process suitable for carrying out the process on a paying basis.

TESTING HARDNESS.

A new device for testing the hardness of steel by impact has recently been invented. A tubular standard, fitted with a hardened steel ball at the lower end, is placed on the steel to be tested. There is a spirit level at the upper end of the standard by which the latter can be brought to a true vertical position. Mounted on the standard is a cylindrical drop weight. By raising this to the top and dropping it, thereby, striking a weight-receiving block at the bottom of the standard, an impact is communicated to the steel ball which makes an indentation in the steel to be tested, similar to that produced by hydraulic pressure with the Brinell machine. The hardness of the steel is determined by measuring the diameter of the indentation with a celluloid scale.

DOMINION STEEL CORPORATION.

THE first quarterly statement to June 30, of the Dominion Steel Corporation under the new order as promised by President Plummer at the last meeting was issued on August 5, and shows earnings of 1½ per cent. on the common stock.

The total earnings available for dividends are given as $705,262.86. From the foregoing amount there falls to be deducted the dividend on preferred stock of the Corporation and constituent Companies, amounting to $245,000. This leaves $460,262.86, from which was taken the common stock dividend of 1 per cent. totalling $318,977, leaving a surplus of $141,285.86. Past experiences indicate that the quarter ending June 30 is the second poorest of the year.

July, it is said, was one of the best months the Corporation has ever passed, the gain in shipments being likely to reach 40 per cent. All departments, excepting the steel rod mill, are expected to show gains.

Fort William, Ont.—M. H. Braden has been awarded the contract for the construction of Fort William's new incinerator at a cost of $12,990, and the John Inglis Co., of Toronto, secured the contract for supplying the steel at $3,350.

Victoria, B.C.—The city has awarded the following contracts for supplies: Mussens, Ltd., for dump cars; the Canadian Fairbanks-Morse Co., ventilating fans; the Hinton Electric Co., two 2 h.p. motors; A. F. Nye, two hoisting outfits; Mussens, Ltd., two drills; the Holden Co., one giant rock drill.

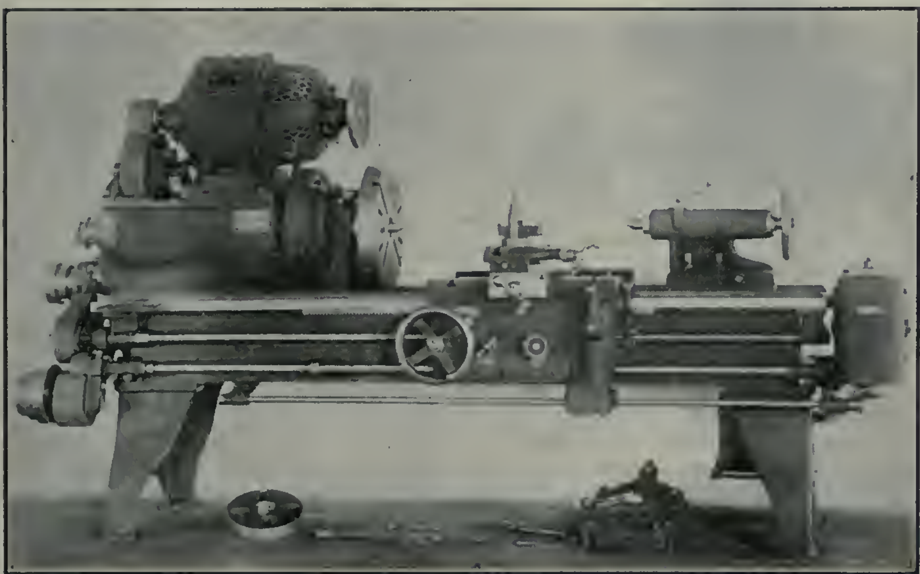
DEVELOPMENTS IN MACHINERY

A Record of New and Improved Machinery Tending Towards Higher Quality and Economical Production in the Machine Shop, Blacksmith Shop or Planing Mill.

MOTOR-DRIVEN HEAVY DUTY LATHES.

THE motor-driven lathes here shown, which are products of the Reed Prentice Co., Worcester, Mass., are specially designed and built to withstand the strain of constant heavy turning, and are adapted for railroad and all kinds of heavy work. The machines are equipped with quick-change gear boxes, which are very easily operated, giving on the 18-inch machine 60 changes, and on the 27-inch machine 54 changes to both lead screw and feed rod.

There are three reductions of motor speeds by gearing and ten changes in controller, giving in all 30 spindle speeds. The fastest and slowest spindle speeds on the 18-inch lathe are 360 and 15 revolutions, respectively, while those obtained on the 27-inch machine are 172 and 5½ revolutions. The headstocks, as may be seen, are of massive proportions. The apron feed works are driven by worm and gears, and there are double frictions for lengthwise and cross-feeds. The lead screw is equipped with thread-cutting index.



MOTOR DRIVEN HEAVY DUTY LATHE.

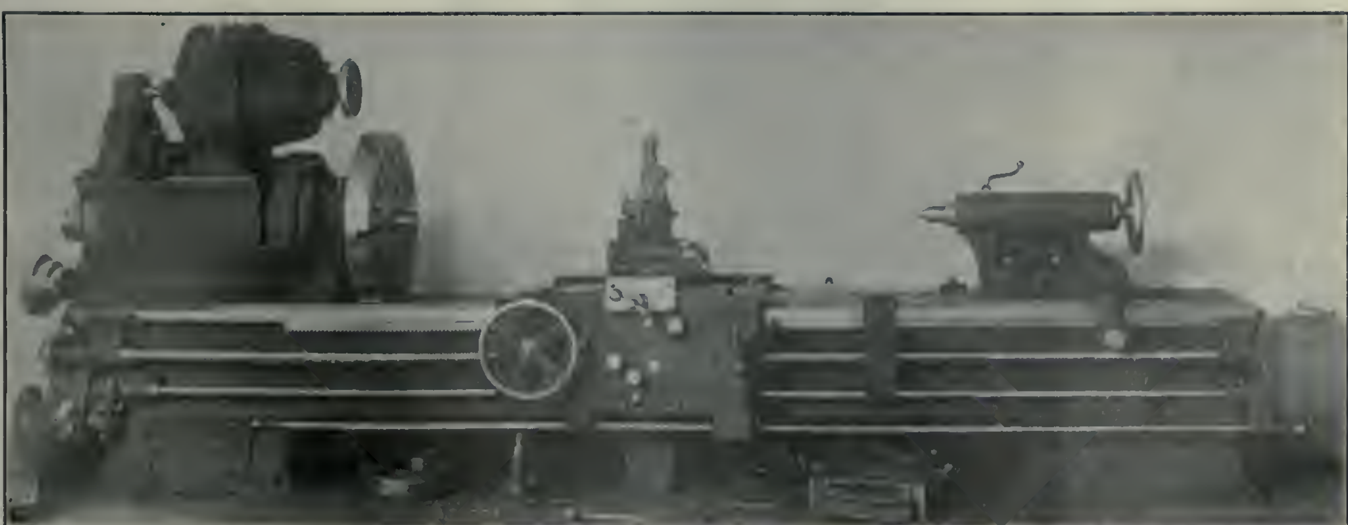
The machines are driven by Westinghouse motors, semi-enclosed, 5 and 11½ h.p. for the 18 and 27-inch types, respectively. The hand wheels shown on the end of the motor shafts are used to turn the face plates in chucking the work to be machined.

MICARTA.

A REMARKABLE new material, known as Micarta, which is claimed to take the place of hard fibre, glass porcelain, hard rubber, built-up mica, pressboard, rawhide, moulded compounds, etc., has been developed by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. It is used for commutator bushings and brush-holder insulation, as noiseless gear blanks, as conduit for automobile wiring, as spools for spark coil and magnet windings, for refillable fuse tubes, for wireless coil separators, for arc shields in circuit-breakers, for water-meter discs, etc.

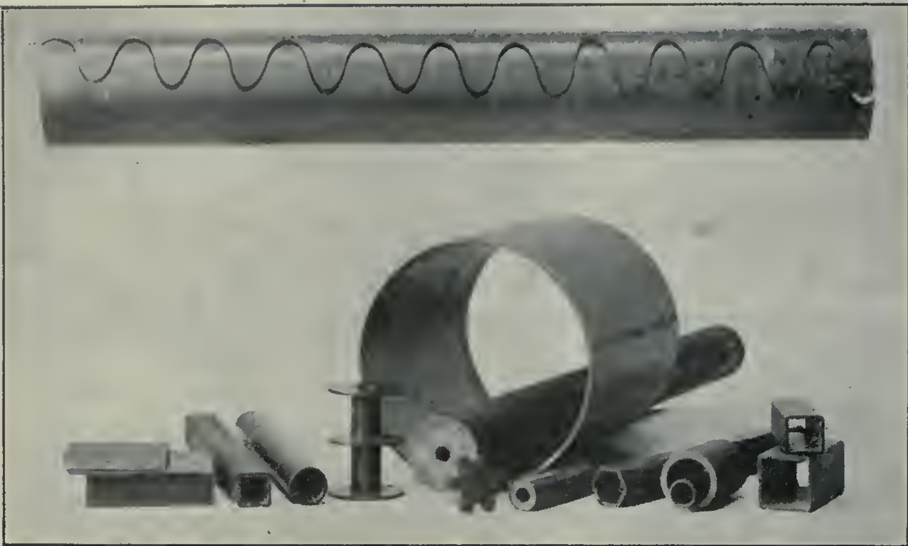
Micarta is a tan-brown colored, hard, homogeneous material having a mechanical strength about 50 per cent. greater than hard fibre. It can readily be sawn, milled, turned, tapped, threaded, etc., if a sharp pointed tool be used, and if the work be done on a lathe. Micarta is not brittle and will not warp, expand or shrink with age or exposure to the weather, but takes a high polish, presenting a finished appearance.

Two grades of the material are made. The grade known as Bakelite Micarta will stand a temperature of 150 degrees C. continuously, or 260 degrees C. for a short time. It is infusible, and will remain unaffected by heat until a temperature sufficient to carbonize it is



MOTOR DRIVEN HEAVY DUTY LATHE.

reached. Heat will not warp Bakelite Micarta, and it will stand an electric arc better than hard fibre, hard rubber, built-up mica, or any moulded insulation containing fibrous or resinous materials. Its coefficient of expansion is low, being approximately .00002 per degree C.



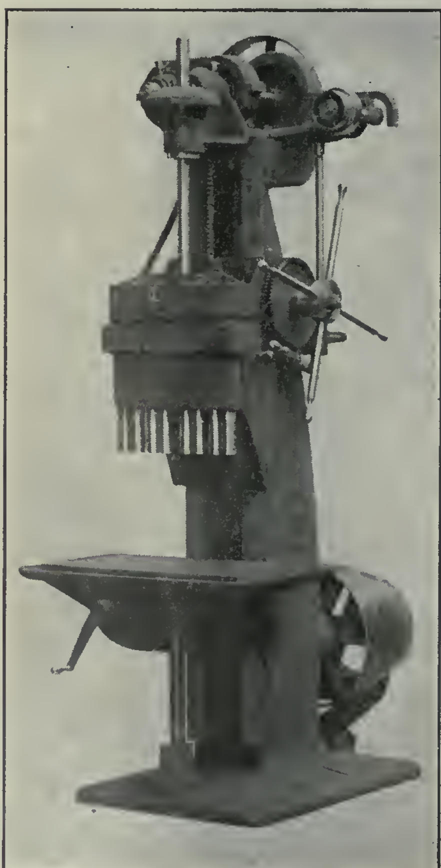
NATURAL BREAK IN BAKELITE MICARTA TUBING.
SAMPLES OF MICARTA PARTS.

Bakelite Micarta is insoluble in practically all of the ordinary solvents such as alcohol, benzine, turpentine and weak solutions of acids and alkalis, hot water and oils. It is indifferent to ozone—an advantage over hard rubber, resins, etc., for electrical purposes. It is non-hydroscopic and impervious to moisture. The other grade designated as No. 53 Micarta has the same mechanical and electrical properties as the Bakelite Micarta, but differs in its chemical and thermal properties. The plain Micarta behaves toward chemicals and heat very much as an ordinary resin. This grade is not used in plate form.

As proof of the uniformity of structure of Bakelite Micarta, the accompanying illustration of a fracture is shown. This is not a saw cut, but a natural break. The tube was held tight on a metal mandrel and a compressive force was applied at one end. When the force became sufficiently great the tube split as shown. The uniformity of the wavy fracture shows how homogeneous the material is. Such a break is known as a "harmonic fracture." It will be seen from the illustration, made from an actual photograph, that the strain followed the true harmonic wave almost as closely as the eye can detect, indicating that every part of the material was exactly as strong as every other part.

MULTIPLE SPINDLE DRILL.

THE 8 spindle fixed centre drill illustrated herewith has been brought out by the Foote-Burt Co., Cleveland, Ohio, and is one type of their No. 15½ multiple spindle drills. This machine is built with any number of spindles, and the spindles can be arranged either universally adjustable, adjustable in a straight line only, or fixed centre as per the illustration. It has been designed for handling automobile work, and is being used extensively on the valve hole work on automobile cylinder castings. It is also used for drilling the sides of the crank case, and for drilling some of the sides of the cylinders, or other multiple work required. It is used more extensively on the valve hole work for boring the large valve port hole, also for machining the valve seat and drilling and reaming the valve stem guide hole.



8 SPINDLE FIXED CENTRE DRILL.

With this type of machine, either having the proper number of spindles, fixed centre, or adjustable in a straight line, a manufacturer is able to do the number of valve holes required on the cylinder as quickly as it would be possible to do one with a single spindle machine. Some people arrange these machines in batteries, according to the number of operations required, and then process the work through same, each machine doing one operation. However, the smaller manufacturer can run a number of cylinders or other parts through the machine for one operation, and then change the tools and run through for the next operation, which of course gives him manufacturing results.

The spindles have large bearings, bronze bushed, and are made of 3½ per cent. nickel steel, and the head slide on the column is extra long to insure rigidity. The driving bevel gears are made of high carbon drop forgings having planed teeth, hardened. The machine is arranged with friction throwout back gears, a Johnson friction clutch being used. This arrangement is for taking care of the large range of sizes between the large valve hole and the valve stem guide hole on the valve hole work, and also adds to the power of the unit.

The machine is driven by three step cone pulley, 15 in., 17 in., and 19 in. x 4¼ in. face. Six changes of power feed are provided by means of two-step cone pulley and change feed gears. Automatic knockoff to power feed is also arranged with quick traverse by large pilot spider wheel. The column is extra heavy, of box section, well ribbed, and the table has large working surface, with oil groove entirely around same, and is raised and lowered by means of jack screw with spiral gearing.

HEAVY DUTY RADIAL DRILL.

THE Fosdick Machine Tool Co., Cincinnati, Ohio, are putting on the market a 3ft. heavy duty round column radial drill, being the first size of a complete line of this type machine which the firm are manufacturing.

The machine combines simplicity, accuracy and durability, and has ample power to handle high-speed drills in a most efficient manner. It is self-contained, requiring no special foundation or countershaft. A very complete metal speed and feed plate for high-speed work is attached.

The base is deep and well ribbed, and is provided with extra large T slots. An oil channel around the base drains into a large reservoir.

The column is of the double tubular type. The fixed inner column extends to the top, where a large ball bearing insures easy swinging of the arm. It is rigidly clamped by a malleable lever which travels with the column, and is adjustable. The clamping surface is extra large, and is provided with means for taking up the wear.

The arm is of pipe section, well ribbed, and has adjustment to prevent sagging, and to provide means for taking up wear. The elevating screw is suspended by a ball bearing, and the arm lowers at twice the elevating speed by a handle placed below for the convenience of the operator. Safety trips for both extremes are provided.

The head is easily moved along the arm by a ball bearing spiral gear. All gears are thoroughly encased, and three changes of speed (through hardened gears and clutches) are made with one lever in front of the head. The tapping reverse frictions are mounted on a sleeve, allowing no grit to be drawn into the mechanism which runs in oil. The adjustment for wear is made from the outside.

The spindle is of crucible steel, and takes the thrust on a special ball bearing. The direct reading depth gauge and automatic trip may be set to the exact depth in any position. A safety trip is at the extreme.

All changes are made with one handle, which has a direct reading index dial. The feed box is low on the head, giving support to both ends of the worm. The worm wheel runs in oil, and the feed pinion is hardened. An overtake clutch permits the hand feed to be fed ahead of the power feed.

The speed box is simple and positive throughout, and has direct reading index. The changes are made by a single lever, and shock is avoided by an overtake arrangement which keeps the machine running at a reduced speed. A latch pin secures the tumbler and prevents chattering on heavy work.

The lubrication system is very complete. Oil chambers, felt wipers or pipes, as the location requires, are provided, and the bearings are of special phosphor bronze.

The machine is so designed and constructed that a motor drive may be added at any time, without the necessity for a special base or speed box. Constant speed, or 3.1 variable speed motors may be used. They are connected by rawhide gearing. The motor horsepower is from 3 to 5, the floor space occupied is 9 ft. by 7 ft. 6 in., and the net weight of the machine 4,200 pounds.

CANADA'S TRADE WITH UNITED KINGDOM.

THE accounts relating to the trade and navigation of the United Kingdom for the six months ending June 30, were recently made public and show the following facts regarding trade with Canada:

	1912.	1913.
Imports	$50,992,000	$53,215,000
Exports produce and mfd. goods	50,338,000	58,414,000
Re-exports	8,576,000	9,001,000

Among the principal articles were the following:

Imports from Canada.

Imports from Canada in 1913: Wheat, $15,909,000; wheat meal and flour, $5,235,000; bacon and hams, $3,029,000; cheese, $3,044,000; canned salmon, $2,377,000; wood, sawn or split, planed or dressed, $4,453,000.

Exports to Canada.

Exports of United Kingdom produce and manufactures to Canada:—Iron and steel and manufactures thereof (so far as distinguished in the monthly accounts), $4,234,000; cotton piece goods, $5,310,000; woollen and worsted tissues (including carpets and carpet rugs), $8,560,000; apparel, $2,403,000.

Merchandise Values Imported and Exported.

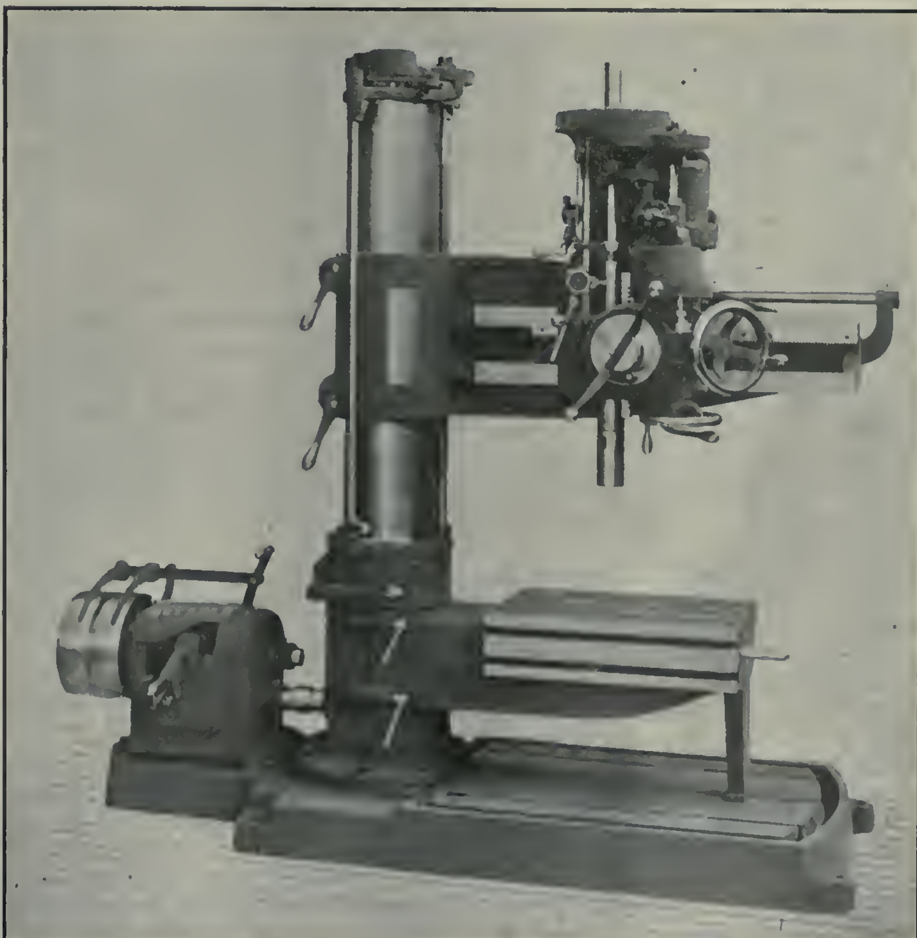
The total values of the merchandise imported into and exported from the United Kingdom from and to all countries during the half year were as follows:

Imports, $1,843,000,000; exports of United Kingdom produce and manufactures, $1,251,000,000; re-exports of foreign and colonial merchandise, $287,000,000. Compared with the figures for the first half of 1912—the highest previously recorded—these totals show the following increases:

Imports, nearly $121,000,000, or 7 per cent.; exports of United Kingdom produce and manufactures, $154,000,000, or 14 per cent.; re-exports of foreign and colonial merchandise, $6,000,000, or 2 per cent.

Food, Drink and Tobacco.

The increase of $121,000,000 in the value of imports includes increases of approximately $36,750,000 in "food, drink and tobacco; $42,000,000 in raw



HEAVY DUTY RADIAL DRILL.

materials and articles mainly unmanufactured," and $41,000,000 in "articles wholly or mainly manufactured."

Chief Export Increases.

The chief increases under the head of exports of United Kindom produce and manufactures are the following:—Coal, $39,600,000; iron and steel and manufactures thereof, $31,000,000; machinery, $13,300,000; new ships, $7,900,000; cotton piece goods, $26,700,000; chemicals, drugs, dyes and colors, $5,400,000.

A large part of the increase in the export of coal is, of course, due to the fact that from the end of February to the end of the first week in April of 1912 a great strike of coal miners was in operation. Even, however, as compared with 1911, the exports of coal show an increase of more than $32,000,000.

RUSHING WORK ON HUDSON BAY RAILROAD.

THE expectation is now entertained that the Hudson Bay Railway will be completed by December, 1914. The work is being pushed ahead with vigor, and the development of terminal facilities at Port Nelson is being driven ahead so that the resources of the new port will assist materially in finishing the northern portions of the railway.

When the Hon. Frank Cochrane took charge of the Department of Railways and Canals, the first contract for the line had just been let. It was for 185½ miles, and called for an expenditure of three million dollars. Owing to the slowness with which the bridge company carried out its contract of bridging the river at Le Pas, there was a good deal of delay and it became necessary to extend the time from December 1, 1912, to December 1, 1913. The bridge, was completed in April last, and, since then, good progress has been made. On July 23, the contractors had reached Cormorant Lake narrows at mile 40, with the steel, and it is hoped to reach mile 60 by August 25. It looks as if 150 miles of grading will be completed this fall. There are 1,200 men on the work, and the only serious difficulty at present is the short supply of ties.

Just before the Minister set out on his journey over the route to Hudson Bay, he let the contract for the second section, 68 miles, from Thicket Portage to Split Lake Junction; the sum involved being $1,800,000. More recently the final section, 65 miles, has been let for $3,700,000. The time for the completion of these two latter sections is December 1, 1914.

The men working at the terminals now number 180, and it is expected that by the autumn 250 will be employed. Five steamers were chartered this summer to carry in supplies and the following plant has been purchased for delivery this season:—Sea-going tug, $43,250; steamboat Kathleen, $10,000; one steel tow barge and two steel sectional scows, $18,500; dredging machinery, $29,000. The Polson Iron Works, Toronto, have completed a large suction dredge and the same company is also at work on a $32,000 stern-wheel tug.

THE WORLD'S COAL SUPPLY.

THE coal resources of the world are dealt with by the Geological Congress in three volumes of 1,360 pages in all, illustrated by upwards of 175 maps and figures, and accompanied by a 68-page atlas of geological colored maps. A digest of the work was last week read before the delegates in session.

The coal production of Canada at the present time is only in the neighborhood of twelve million tons annually, and though the output may be expected to increase rapidly, actual exhaustion of the supply lies very far in the future.

Total Reserve of Coal.

The total reserves of the world, compiled from all the reports received, amount to 7,397,533 million tons, of which nearly 4,000,000 millions are bituminous coals, nearly 3,000,000 millions are brown coals of various grades, and nearly 500,000 millions are anthracite coals. Of the anthracite coals, Asia, with the great Chinese fields, has by far the largest supply of any of the great continental divisions, furnishing 407,637 million tons; in bituminous coals, America with 271,080 million tons leads by a great margin, as she does also in the various grades of brown coals.

World's Production of Coal.

The world's production of coal for the year 1910 was about 1,145 million tons, so that, though much must be allowed for loss in mining and for areas that for various reasons cannot be economically mined, there still remains many hundreds of years before exhaustion of the supply may be looked for. Taking up the individual countries, however, it is found that in more than one case the end is in sight.

WORKING HOURS AT C.P.R. ANGUS SHOPS.

THE reduction in the number of working hours and consequent loss of pay to the workmen in the locomotive department of the C.P.R. (Angus shops) which began on August 1st, has been somewhat modified by the company, and instead of being idle all day on Saturday, the men will work four and a half hours on that day each week. This will mean that instead of the hours being reduced from fifty to forty per week, which would have resulted in a loss of an average of $4.00 per man weekly, or a total of about $800, as it affects about two hundred men, the hours worked will now be forty-four and a half and the loss will average only about $2.20 per man.

While the men regret that in the summer months it has been found necessary to curtail the working days, yet they prefer this method to having any of their number discharged for want of work.

DOMINION METALLURGICAL LABORATORY.

ANNOUNCEMENT is made concerning the installation at Ottawa of a modern metallurgical laboratory by the Mines Branch of the Canadian Department of Mines. It is to be devoted to concentration and metallurgical tests of Canadian ores and minerals, and will be operated free of all charges, including necessary assay. Reports of the tests are to be incorporated in the publications of the Department. Suitable crushing, screening, sampling, amalgamation and concentration apparatus are features. An experimental sintering and roasting plant is to be added.

WELSH TIN PLATE IN CANADA.

WELSH tin plate manufacturers are making an effort to get back the Canadian tin plate trade, which has been largely taken by the United States in the past year. They have interviewed the Colonial Secretary and the President of the Board of Trade with a view to having them exert their influence in Canada. It is intimated in British journals that the Canadian customs officials have misread the tariff law, with the result that American tin plate manufacturers have profited at the expense of those in Wales. Representations have been made to various members of tthe Canadian Parliament, who have expressed themselves as being in favor of an alteration of the law. It is charged that American tin plates are sold in Canada at dumping prices, and the Welsh tin plate makers want the anti-dumping provision of the Canadian Tariff Act put in force.

Alex. Gibb, St. Nicholas Bldg., Montreal, has been appointed sole agent in Ontario and Eastern Canada for the roller bearing rollers and seeders manufactured by the Dunham Co., Berea, Ohio.

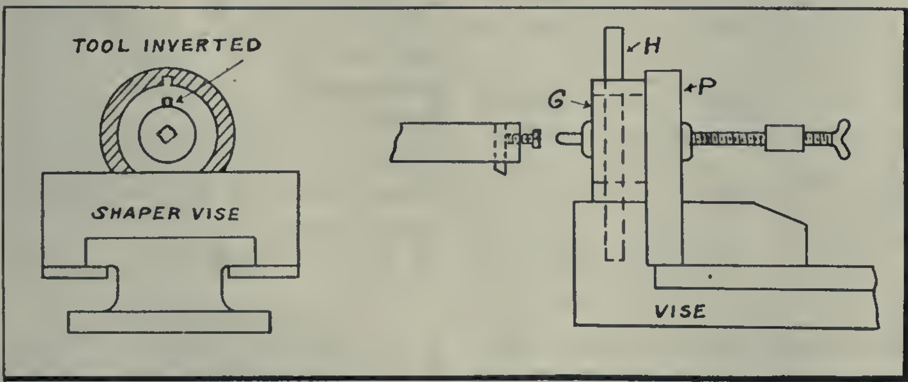
MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

KEYSEATING IN THE SHAPER.

By D. A. Hampson.

THE range of usefulness of the shaper as a keyseating tool may be widened by the two kinks shown in the illustration. Neither of them involves any expenditure for special fixtures or tools, although it is assumed that an extension for keyseating is a part of the shaper equipment, and that the "clapper" block can be bolted down so that it cannot lift on the return.



KEYSEATING IN THE SHAPER.

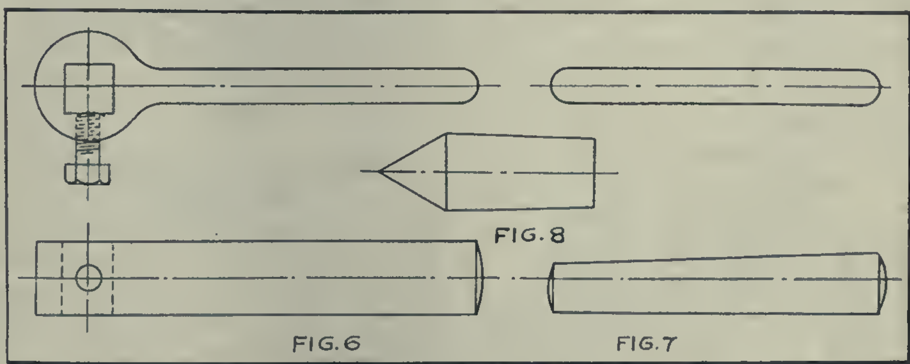
To cut a keyseat in a ring, collar, or gear the natural way is to turn the vise so that its opening is in line with the travel of the ram; however, pieces do show up which, because of lightness, extending hubs, and interfering parts, cannot be held in this manner, and the width of metal available for holding is not sufficient to permit the vise to be swivelled 90 deg. The ring shown in the first illustration is an example of such a case. By blocking the tool holder from lifting and pointing the cutting tool upwards, the keyseat may be cut with ease and ample gripping surface secured to preserve alignment and provide rigidity.

In the second figure is shown a kink for holding a lever arm, quadrant, or any similar piece having projecting parts that will not let it go down in the vise. Two parallels are clamped upright in the vise, a predetermined distance apart. Against them the work is held by two C-clamps. A shorter and stiffer tool may be used if these two methods are employed; no time is lost on an elaborate "set-up," and the vise is not removed from the machine. An awkward shaped casting can be set up in less than ten minutes by the second method—noting the piece in the figure, (G), is the casting held against parallel (P.) The quadrant (H) makes the piece slow to set up by ordinary methods.

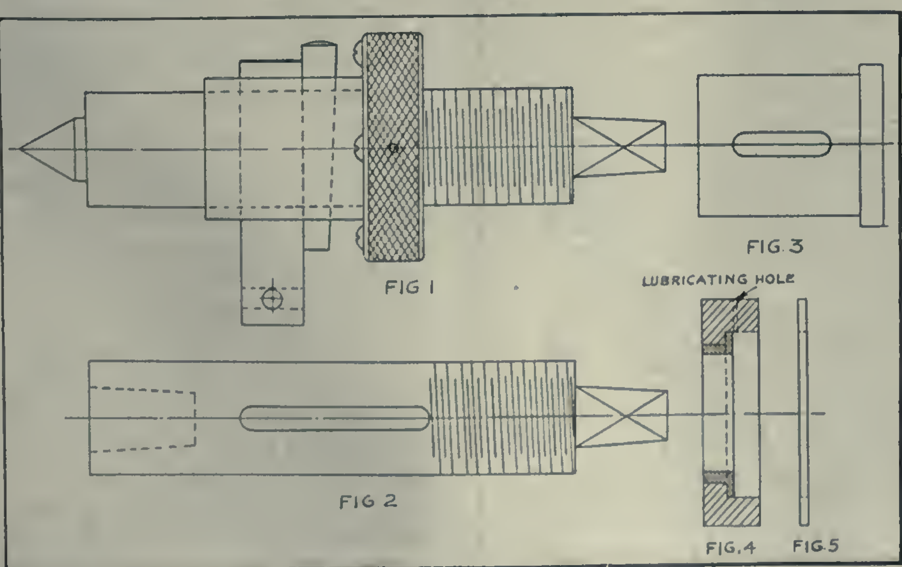
SELF-FEEDING CUTTER BAR.

By H. Womersley.

THIS is a very effective and efficient tool, there being lots of jobs on which the self-feed cutter bar can be used to advantage, such work as cutting large holes in boiler plates, bulkheads, etc. The bar can be used in a ratchet or air drilling machine. A general view of the bar is shown in Fig. 1, and detail parts are shown in Figs. 2 to 8.



SELF FEEDING CUTTER BAR.



SELF FEEDING CUTTER BAR

To Make Cutter Bar.

Having decided to use bar in the ratchet, cut off mild steel bar to length. Turn and put fine thread on bar; 15 threads per inch is a suitable pitch. Next bore out shaft end for cast steel centre. When putting in cotter slot, make the latter long enough, because the longer the cotter way, the greater the traverse.

Next make sleeve as shown in Fig. 3. Bore out to suit bar, then turn as shown. Cut out slots to take tool-holder and cotter. Make a nut as shown in Fig. 4, turn outer shell, then insert brass brush and threads to suit bar, also knurl outside of nut.

Fig. 5 is a collar, ⅛ inch thick, turned on outside diameter to the same size as nut, and bored out to fit easy on sleeve. It is fixed to nut with four ¼ in. screws as shown. Figs. 6 and 7 show tool holder and cotter, while Fig. 8 is the cast steel centre. Do not forget a lubricating hole in nut.

TRUCK STANDS FOR GEARS AND PULLEYS.

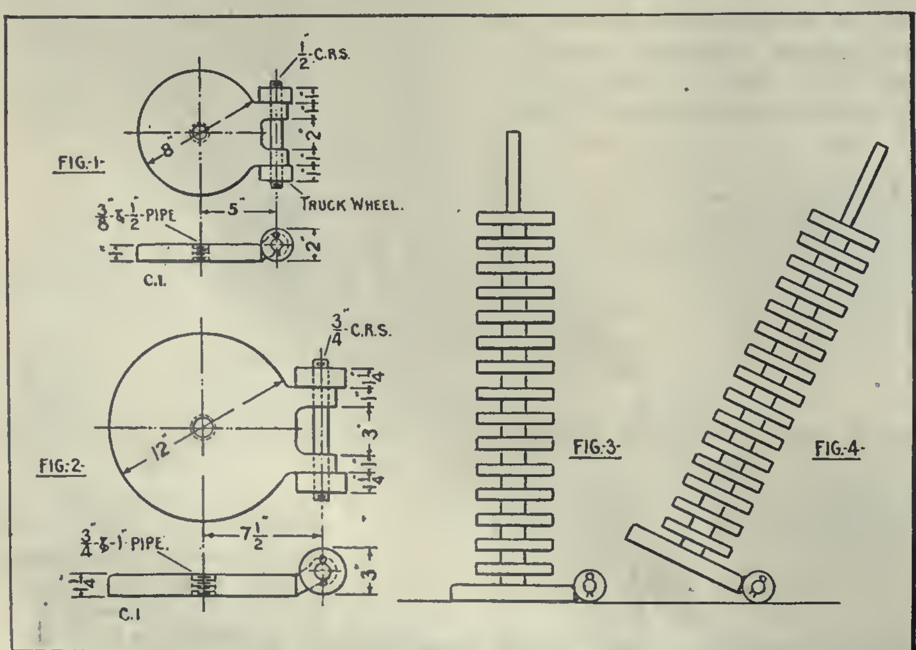
James E. Cooley.

PERHAPS no feature of machine-shop practice has been given so little attention as the method of piling up gear blanks and pulleys during machine operations. Common ways of keeping them together consist in piling them in heaps on the floor near the machine, or stacking them one on top of the other, and inserting a rod, pipe, or round stick through their hubs. In some instances, the rod or pipe is attached to a base, but, where no base is used, the rod or pipe must nearly fit the holes in the hubs of these stacks will topple over. Where the work is piled on the floor in heaps, considerable room is taken up, they are easily jammed or broken; besides, it requires the handling of each piece separately when removing to another machine or department. When a large number of these pieces have to be machined; the most reliable and inexpensive way of handling and keeping them together is by means of stands made from wrought-iron pipe screwed into a base for this purpose.

In the accompanying illustration are shown two designs of bases that when piped up will hold a large quantity of this class of work, as well as cams, flanges, and other special pieces. Fig. 1, is a base 8 inches diameter, into which can be screwed either a ⅜ inch or ½ inch wrought-iron pipe. This will hold the lighter class of work up to 8 inches diameter. The base in Fig. 2, having a ¾ inch or 1 inch pipe is stronger, and takes in work up to 12 inches diameter.

An improvement in trucking these stands from a lathe to a gear cutter or splining machine, etc., is shown by having truck wheels attached to the base. The usual method of moving these stands is by means of a two wheel truck. When the stand is carried in this way, it requires considerable care to keep the pieces on the truck, owing to their circular shape, and, as the truck moves, they roll and shake, and become jammed and nicked up on the iron-work of the truck.

In Fig. 3, is shown a stack of gear blanks ready to be moved. By taking hold of the end of the pipe for a handle, and tilting the stand back as in Fig. 4, it can be easily rolled along the floor to any required distance. These stands can be extensively employed in every machine shop, and should be made up several at a time. The dimensions are given for the bases, trucks, and shafts. The pipe used can be cut any convenient length up to 6 feet.



TRUCK STANDS FOR GEARS AND PULLEYS.

CONVENTION OF LOCOMOTIVE ENGINEERS.

THE International Brotherhood of Locomotive Engineers held their Annual Convention at Montreal during the week ending August 9. Convention headquarters were established at the Windsor Hotel, and there over 2,300 delegates and their wives registered during the week. In all there are some 80,000 members of the 900 lodges of engineers scattered throughout the western hemisphere, and, although this was the function of the Canadian branches, there were present a large number of members resident in the United States.

On Tuesday, August 5, the delegates were given a public reception, being welcomed on behalf of the Mayor and the civic authorities by Alderman Macdonald. In the evening a musical programme was carried out. The reception committee arranged an interesting series of sight-seeing trips in and around Montreal, and these alternated with the business sessions. The latter were not open to the public, but it is understood that some very interesting sessions were held, and that both from a business and social point of view the Convention was a great success.

WHAT IS AN ION?

SIR WILLIAM RAMSAY, writing in Harper's Magazine, says—For long, electricity was supposed to be a mysterious fluid, or rather, two mysterious fluids, one of which was called "positive," the other "negative." It has now been shown, thanks to the investigations of Sir J. J. Thomson, of Cambridge, that what was known as a current of "negative" electricity is, in actual fact, a stream of small particles moving with great velocity. These particles of electricity, known as electrons, can combine with matter. Metals are such compounds; and gases like oxygen and nitrogen have also electrons associated with them.

When an atom of oxygen, of iron, or indeed of any substance, has been deprived of an electron, or has had an electron added to it, it becomes an ion. If the electric particle has been removed, it is said to be a positive ion; if the electron has been added, it is called negative.

The word "ion" means "going" or "travelling." Such atoms are easily attracted to or repelled by electrified bodies, and they move rapidly toward them, or away from them, as the case may be. If the electrification of the body is negative—that is, if there be an excess of electrons adhering to its surface—it repels particles which have also an excess electron; if, on the contrary, the electrified body is electrified by having had electrons removed (and that is called positive electrification), then it will attract particles having an excess electron.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

BLAST QUANTITY AND PRESSURE IN CUPOLA WORKING.*

By F. J. Cook.

THE writer has for many years had under consideration the action of blast furnace pressure, but for a very long time was unable to investigate the distinctive action of quantity apart from pressure, owing to the want of proper measuring apparatus. The advent of pneumatic tools, and the wider adoption of compressed air has, however, led to much thought and research on the measurement of the latter, and the results obtained by various investigators have been helpful in the design of an apparatus suitable for the experiments under consideration.

Flow of Air Measurement.

There are now many well-recognized methods of measuring the flow of air, the one used in this investigation being that by which the measurement is made by the change of pressure between the entrance and throat of a Venturi tube or convergent-divergent nozzle. It has the considerable advantage that the greater portion of the pressure drop which is utilized for measuring the velocity is recovered by the air before leaving the tube. For instance, with a pressure drop of 6 inches of water between the entrance and the throat of the Venturi tube, the drop between the entrance and the exit was only about 1 in. of water. In this case an error in reading the manometer gauge of 0.1 in. is only productive of an error less than 1 per cent. in the calculated volume of air passing.

It may be observed here that the common practice of measuring air by volume is evidently less desirable than that of measuring it by weight, since the amount of oxygen available for combustion of the coke and melting of metal in a cupola is directly proportional to the volume after suitable corrections for pressure and temperature have been applied, which corrections will vary from day to day, if not from hour to hour. For this reason, the measurements of quantity of air per minute have been considered in terms of weight throughout this paper.

Two cupolas of the dimensions given in Table 1 were available for experiments. It will be noticed that these not only vary in their diameters at the melting zone, but that the smaller one has a greater tuyere area than the larger, therefore, if formulae can be adduced to which these two very differently proportioned cupolas will conform, they may reasonably be considered correct for cupolas in general. Air was supplied by a Piftin type of rotary blower driven by a variable-speed electric motor. For outputs of air below that to be obtained with the lowest speed of motor, the blower intake was throttled.

TABLE 1.—PARTICULARS OF CUPOLAS.

Cupola	B	A
Diam. at melting zone	2 ft. 3 in.	3 ft. 6 in.
Area of tuyeres in sq. ins.	94.4	91.2
$\frac{AZ}{AT}$	6	15
Height from top row of tuyeres to charging door sill	13 ft. 1 in.	13 ft. 4 in.
Number of tuyeres	8	7
Rows of tuyeres	2	2

AZ—Area across cupola at melting zone.
AT=Total area of tuyeres.

Maximum Output With Varying Blasts.

After some preliminary investigations, it was decided to ascertain the maximum output of molten iron that could be obtained with varying conditions of blast. The routine observed was to start up the cupolas in the ordinary way, and in half an hour or so after the blast had been put on—which was considered sufficient time to insure that the coke bed had reached the normal height—the blower was regulated to give the desired output of air, the cupola was emptied of all molten metal and the trial commenced. Every care was taken to insure comparative working; the metal was weighed to pounds, the coke measured, the stock kept up to the level of the cupola charging-door sill, and all tuyere sight-holes and slag-holes kept closed during the trials, which lasted from one-half hour to one hour each.

Readings of quantity and pressure of the blast were taken every 2½ minutes and the molten metal was measured in the same ladle for each test, and independently checked by three persons. The whole of the metal melted during each trial was kept in the ladle before pouring. The summary of the results are given in Table 2.

One of the outstanding features of these results is the regular working which ensued during each trial, the average of pressure multiplied by quantity practically equalling (and in some cases actually so) average pressure multiplied by average quantity. The output given is the maximum which can be obtained over a short period. Over a fair afternoon's blow, the large cupola gave within 10 per cent. of the maximum shown in Table 2, and the small one within 15 per cent.

Expert Opinions.

John Jermain Porter, formerly professor in the University of Cincinnati, in an article in the Engineering Magazine says: "The maximum output of a cupola was obtained with 25 to 30 lb. of air per sq. ft. area of melting zone." To this, the large cupola approximated; but although the figures stated give a margin of 20 per cent., it is obvious they will not apply in the case of the small cupola, seeing that the minimum air supplied was 43 and the maximum 57 lb. per sq. ft. area of melting zone.

Dr. R. Moldenke shows in a recent article that the melting zone in a cupola is probably around an inverted cone, with which the author agrees. The proportions of this cone will necessarily be dependent upon the penetrating influence and velocity of the blast due to its pressure as well as to the quantity of air. If, therefore, pressure and quantity are both dominating factors, any theory that leaves out one or the other is not based on sound principles.

Rate of Output Limited.

As may be expected, there is a limit to the rate of output of any cupola, and it is excessive oxidation which will in general set this limit. Again, a comparison of the dimensions and results obtained with the two cupolas shows that the maximum weights of iron per hour which could be melted were approximately proportional to the diameters of the melting zones. These conclusions may be combined into two quite simple laws as follows:

1.—That the output of any cupola up to its maximum value in tons per hour is equal to the product of the air supplied in pounds per minute multiplied by the square root of the pressure of the air in ounces and divided by 120.

2.—That the maximum possible rate of successful output will be obtained when the square root of the pressure of the blast in ounces multiplied by the quantity of blast in pounds per minute divided by diameter of melting zone in feet equals 330.

Effect of Blast.

In addition to the blast pressure, having an effect upon the melting ratio in a cupola, it also has a large bearing on the quality of the metal produced, as distinct from quantity. As pressure has been shown to be of much import-

*From a paper read at the recent British Foundrymen's Convention.

ance, it necessarily follows that the size of the tuyeres (on which pressure so largely depends) should receive careful consideration; and it is the author's opinion that where the castings are required to have the maximum softness, the total area of the tuyeres should not be over one-sixth the area of the melting zone.

For general engineering work, which is usually much heavier than the former, and where iron closer in texture is desired, tthe tuyeres area should be about one-ninth the area of melting zone, and lb. of metal melted. In the experiments under consideration, the average composition of the coke was 92 per cent. carbon, and the consumption was 0.075 lb. per lb. of iron melted.

Conclusions.

The author's opinions and experience, together with the results of the tests given, lead him to the following conclusions:

1.—That both pressure and quantity of blast have to be considered in cupola working.

2.—That an average of 120—in terms of quantity of air in pounds, multiplied by the square root of the pressure in ounces—is required to melt one ton of ordinary phosphoric iron.

3.—That the maximum output of metal melted per hour is more nearly comparative to diameters than areas of cupolas.

4.—That the maximum output of a cupola will be obtained when the pressure and quantity of the blast in ounces and pounds per minute respectively, are so adjusted that the quantity of blast in lbs. per minute, (W), multiplied by the square root of the pressure of the blast in ounces, (P), and divided by (D)=330; D being the diameter of the melting zone in feet.

4a.—That any further increase in the product (W), multiplied by the square root of (P), beyond that determined in conclusion (4), results in excessive oxidation of the metal in the cupola.

5.—That iron melted in a cupola is affected in hardness directly as the pressure of blast used.

6.—That in consequence of (5), the total area of the tuyeres employed should be regulated according to the class of iron being melted, small areas being used when greater hardness is required.

7.—That the height of the cupola, from the top tuyeres to the charging-door sill, should not be less than two and a half to three times the diameter across the melting zone.

8.—That the coke consumption in a well-designed cupola need not be more than 0.075 to 0.09 lb. per pound of ordinary phosphoric iron melted, when the coke contains from 90 to 92 per cent. of carbon.

TABLE II.—SUMMARY OF TESTS.

Test number	1	2	3	4	5	6	7	8	9	10	11	12
Cupola	A	A	A	A	A	B	B	B	B	B	B	B
*Cubic ft. of air per min.	2,155	2,433	2,710	2,616	2,810	2,780	2,736	2,894.4	3,020	3,135	3,236	3,471
Height of barometer	30 in.	29.62 in.	29.33 in.	29.44 in.	29.8 in.	29.5 in.	29.8 in.	29.44 in.	29.3 in.	29.5 in.	29.4 in.	28.94 in.
Aver. lbs. of air per min.	171	192	214	206	227	222	221	231.5	242	255	267	285
Pressure of blast in oz.	9½	10	11	14½	15	10	11½	14	14½	15	16	18
Average of W+vP	526	606	710	784	880	702	750	866	866	987	1,069	1,210
Metal melted per hour	4 tons 8 cwts	4 tons 18 cwts	5 tons 5 cwts	6 tons	5 tons 12 cwts	5 tons 4 cwts	6 tons 8 cwts	7 tons	7 tons 12 cwts	8 tons 10 cwts	9 tons 8 cwts	10 tons
Average composition of metal: Silicon 2.7%	throughout all the tests											
Average composition of metal: Phosphorus 1.5%	throughout all the tests											
Coke used per 10 cwt. charge =85 lbs.	throughout all the tests											
Aver. carbon in coke= 92%	throughout all the tests											
Lbs. of metal melted per minute per sq. ft. area of melting zone	41.2	45.9	49.2	56.3	52.5	20.17	24.83	27.1	29.5	32.98	36.3	38.66
Cubic feet* of air per ton of iron melted	29,386	29,780	30,970	26,160	30,106	33,000	25,560	24,806	23,760	22,080	20,640	20,820
Aver. value of lb. of air Xvpressure in ounces ÷ tons of melted metal.	119.5	123.8	127.2	118.3	157	135	117.1	123.8	121.3	116	113.6	121
Condition of metal	Fairly hot	Hot	Very hot	White hot	Not very hot at first, became very dull afterwards	Rather dull	Fairly hot	Hot	Hot	Very hot	White hot	Hot at first, became dull afterwards.

*Volume measured at pressure and temperature existing in the blast pipe.
P=Pressure of blast in ounces. W=Lbs. of air per minute.

for steam and gas-engine cylinder and similar work, the total tuyere area should be from one-twelfth to one-sixteenth the area across the melting zone.

Height of Cupola.

The height of the cupola from the top of the tuyeres to the charging-door sill appears also to have a bearing on the efficiency of the cupola. The results of a great many particulars published in the technical press have shown that where this dimension has been not less than two and one-half to three times the diameter across the melting zone, the cupolas have given much better results than in cases where the dimension has been less.

Coke Quality and Quantity.

An item of very great importance in the economical working of a cupola is the quality and quantity of coke used. Probably John Jermain Porter has done more work on the thermo-efficiency of coke in the cupola than anyone else, and in the article previously referred to, he states that, with coke containing 90 per cent. of carbon, the consumption with well-designed and economically-worked cupolas should not exceed 0.09 lb. per

ALGOMA STEEL CO. BREAKING RECORDS.

IT is clear, says a press despatch, that all records previously made will be broken by the Algoma Steel Co. this year. Last month the record was broken, 29,300 tons of steel rails being rolled. In addition, on the last night of the month, the daily record was broken in the rail mill, and over 1,400 tons of rails were rolled for the twenty-four hours ended by that night. The total steel production by the company for the present year will in all probability be at least 25 per cent. greater than that of any previous year. In fact, on its earnings alone, the Algoma Steel Company will he in a position to materially assist the holding company in the payment of dividends this year.

The deal with the Spanish River Co. is also a great advantage to the Corporation, enabling them to compete in the American and general markets on much more favorable terms, as they will now be able to market much larger quantities of paper.

In the mines branch work is proceeding very favorably at the Magpie mine, about 1,000 tons per week being shipped to the "Soo," where the ore is much liked by the open hearth department. Of course, about five-sixths of the ore used by the plant is imported from the Mesabi, but with the construction of the new plant, which is planned to double the present capacity of the steel works, and the installation of a battery of at least ten open-hearth furnaces, the demand for Magpie ore will be greatly increased.

In addition, the Helen mine is being reopened, and it is probable that furnaces will be installed to roast the ore from the new ore body, which is Siderite. The addition of the new open-hearth furnaces will take care of any ore produced by this property.

Railway construction on the Algoma Central, and also the Algoma Eastern Railway is proceeding very satisfactorily. On the Algoma Central the line is graded well beyond Franz, and it is expected that the whole line to the National Transcontinental Railroad will be practically completed by the winter. Altogether, the entire plant is giving evidence of decided success and efficient management.

CANADA'S TRADE WITH NEW ZEALAND.

WHILE Canada's trade with New Zealand is steadily increasing, according to the reports of Trade Commissioner Beddoe, the percentage of the New Zealand trade is less than that of many countries which have no preferential treatment. For the fiscal year ending March, imports from Great Britain were 59.2 per cent. of the total; from Australia, 12.9 per cent.; from the United States, 9.8 per cent.; from Germany, 3.1 per cent.; and from Canada, 1.8 per cent.

New Zealand extends preferential tariff treatment to Canada over a certain list of articles, and, in the fiscal year 1913, it worked out thus: Imports from Canada under the preference were valued at $968,450, and imports in respect of which there was no preference were valued at $1,070,760.

Exports from New Zealand to Canada for the fiscal year were valued at $2,943,505, and for the eleven months ending February, 1913, New Zealand sent $1,334,270 worth of butter to Canada under the preferential tariff.

TRAFFIC OF PORT OF MONTREAL.

THE revenue from the traffic of the port of Montreal for July increased in every department except exports, which were stationary in volume, as compared with the corresponding period of last year. Receipts from local traffic showed a phenomenal increase, over 50 per cent. more than for July, 1912.

The collector of customs reported receipts from imports of $42,000, as against $38,000 for July last year; from exports, $17,000, the precise amount which was collected for July, 1912; total, $59,000, as compared with $55,000. The wharfinger for local traffic reported receipts of $18,072.69, compared with $12,530.74 for July, 1912.

Adding the amounts previously reported since the opening of navigation, there is a total for this year of $214,918.05, as compared with $191,729.16 for last year to July 31 inclusive, an increase of $23,188.89. This increase is made up from increased imports, $13,500; exports, $3,500, and local traffic, $6,188.89.

EXTENSIONS AT THE MONTREAL LOCOMOTIVE WORKS.

WITH a view to increasing the output of their Longue Pointe shops, the Montreal Locomotive Works, Ltd., are at present engaged in making extensive additions to their plant and equipment. The machine shop is being extended 220 ft. by 132 ft., and when this is completed the present machines will be largely rearranged and a considerable amount of new machinery installed.

A new grey iron foundry is also being built. This measures 220 ft. by 330 ft., and will consist of three bays. The coke, pig, etc., will be stored under cover in a high bay adjacent to the east side of the foundry, and this bay will be served by an overhead traveller, which will raise the charges in skips and deliver them direct to the charging platform. The charges will be weighed directly in the skip by means of a portable multiple beam scale suspended from the crane hook.

A running shed, 75 ft. by 120 ft., is also being built, and will be served by a 10-ton traveller. This shed will give great relief to the erecting shop, for, as soon as the heavy erecting work and the wheeling is finished, the engine will be moved to the running shed, and the lighter work completed under the 10-ton crane.

The improvements on hand will involve an expenditure of $600,000, and are expected to increase the output by more than one-third.

During the year ending June 30 the Montreal Locomotive Works turned out 300 locomotives, and when the full benefit of the new additions is felt, this capacity will be increased to over 400 heavy engines per annum.

SMELTING ORE IN SWEDEN.

ELECTRIC iron ore smelting is making comparatively rapid progress in Sweden, several installations already being in operation, and the erection of others is under contemplation. At the Stord Kopparbergs Bergslags Co., electric iron ore smelting has been going on for some time, both in the furnace started in 1911, and in a 6,000 horse-power furnace completed in the course of last year; in the latter ferro-silicon is being produced.

An electric pig iron furnace of the Helfonstein type, owing to certain circumstances, was not completed during 1912, but is now likely to be started soon. A series of experimental smeltings have been going on, in a smaller and older electric furnace, so as to ascertain the suitability of charges of different kinds of iron for electric smelting.

At Kirunavaara, the erection of some electric iron ore smelting furnaces has been proposed by the well known expert, Mr. A. Gronvall, the managing director of the Elektrometal Co., who has applied to the Government for a concession to reduce electrically the so-called (A) ore at the place where it is being broken. The following conditions are laid down in the application:

1.—The right to break and utilize, in the manner mentioned, up to 50,000 tons of ore, principally (A) ore, per annum for a period of not less than forty years, on deposits belonging to the State and subject to a royalty to the State of 1 kr. per ton of the ore used for the said purpose.

2.—The granting of 30 per cent. allowance on the current rates of freight for the transport of ore, coal, and pig iron on the Lulea-Riksgrausen Railway.

3.—The right of use of the necessary area on land belonging to the State in the vicinity of Kiruna Railway Station.

The plan comprises the building of two electric furnaces, each of 4,000 horse-power capacity, which will entail an expenditure of 1,000,000 kr ($275,000), in addition to which some 500,000 kr. will be wanted for working capital.

A staff of some fifty men will be required, and the value of the annual turnover is calculated at about 2,000,000 kr. The installation is expected to be ready in the beginning of 1915, at the same time that electric energy from the State hydro-electric power station at Porjus should be available.

A sheet steel belt, 4 inches wide, is used in the works of Benz & Co., builders of automobile and crude oil engines, at Mannheim, Germany, in place of a 16-in. double leather belt.

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Subscribers who are not receiving their paper regularly will confer a favor on us by letting us know. We should be notified at once of any change in address, giving both old and new.

Vol. X. AUGUST 14, 1913 No. 7

PRINCIPAL CONTENTS.

THE STUDY SEASON LOOMING UP.

EVIDENCES are not wanting that the "good old summer time" is becoming spent, and that its once myriad invitations and opportunities for play, at least in our hours of leisure, are dwindling percepibly in number perceptibly in number

The educational side of our nature makes a strong appeal for consideration about this time, and the different technical organizations and institutions which cater to this feature begin to lay their plans to meet the need. Incidentally, a too large percentage of mechanics are quite deficient in the most elementary principles and application of an education based on reading, writing, arithmetic, grammar and composition; this we consider a great handicap to the propagation and development of the technical feature. Operative readers should set themselves a course of study in those directions in which they feel themselves most lacking, care being taken, of course, that the achievement set be not so exacting as to become a burden.

TRADE PAPER EDITORIAL CODE.

THE precepts herewith were first given expression to by their author, J. George Frederick, in a speech delivered before the Grocery Trade Press Convention, and were read later before the Allied Trade Press.

The co-operative efforts of those responsible for Canadian Machinery publication are, needless to say, shaped in conformity with the ideals herein set forth, and the measure of success in compassing these, has been such as to merit the commendation of advertisers, non-advertisers, and subscribers alike.

Never discriminate in editorial columns between advertisers and non-advertisers; either by what you say or what you do not say, or by the way you say things.

Never, even in the sublest way, turn the weight of your influence against your readers' interests—either by printing certain articles or editorials, or by failing to print them, or by minimizing and discrediting.

Never print a single word or line furnished by an advertiser which you wouldn't publish if it came in through the regular editorial channels.

Accept no advertising contingent upon the publication of any editorial matter.

Have no favorites in the field among advertisers, whether that favoritism is conscious or unconscious.

Never worry about an advertiser's kick about your editorial policy, if that policy is wholesome, constructive and in your readers' best interests.

Treat personal items about advertisers, and individuals connected with them, exactly as you treat others, for be sure that personal favoritism or personal knocking is quickly sensed and judged by readers, no matter how subtly done.

Give your properly appointed editors a thorough education in the practical but high-minded ethics of editing, and then let them be the final judges of editorial questions which arise in relation to advertisers or advertising.

Standardize your advertising solicitors' replies to all efforts of advertisers or others to use influence editorially: "Our editors must be the judges of such matters; get in touch with them; they will be glad to consider any suggestion. I am authorized to talk only about advertising."

Keep editorial department in practical touch with advertising department, but simply to study the pulse of the field as evidenced by the activity in its "selling end" (the advertisers), so as to turn around and the more accurately and completely serve the "buying end" (the subscribers).

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

	Mont'l.	Tor'to.
Foundry No. 1 and 2, f.o.b., Midland	$17 50	$16 50
Grey Forge, Pittsburg.	.....	14 65
Lake Superior, charcoal, Chicago	.....	16 25
Canadian f'dry, No. 1..	$20 00	$18 50
Canadian f'dry, No. 2..	19 50	18 00
Middlesboro, No. 3....	20 00	21 50
Summerlee, No. 2	22 00	26 50
Carron, special	22 75	.....
Carron, soft	22 25	.....
Cleveland, No. 1......	20 50	22 00
Clarence, No. 3	20 00	21 00
Jarrow	.....	23 50
Glengarnock	.....	26 00
Radnor, charcoal iron.	30 00	34 50
Ferro Nickel pig iron (Soo)	.....	25 00
Staveley, No. 1	20 00	22 50
„ No. 3	20 00	22 00

BILLETS.

	Per Gross Ton.
Bessemer billets, Pittsburgh ..	$26 50
Open hearth billets, Pittsburgh	26 50
Forging billets, Pittsburgh	34 00
Wire rods, Pittsburgh	29 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto..	2.10
Steel bars, f.o.b., Toronto........	2.20
Common bar iron, f.o.b., Montreal.	2.10
Steel bars, f.o.b., Montreal.......	2.20
Bessemer rails, heavy, at mill....	1.25
Iron bars, Pittsburgh	1.55
Steel bars, Pittsburgh, future	1.40
Tank plates, Pittsburgh, future...	1.45
Beams, Pittsburgh, future	1.45
Angles, Pittsburgh, future	1.45
Steel hoops, Pittsburgh	1.60

F.O.B., Toronto Warehouse.	Cents.
Steel bars	2.30
Small shapes	2.40

Warehouse, Freight and Duty to Pay.	Cents.
Steel bars	1.85
Structural shapes	1.95
Plates	1.95

Freight, Pittsburgh to Toronto.

18 cents carload; 21 cents less carload.

BOILER PLATES.

	Mont'l.	Tor'to.
Plates, ¼ to ½-in., 100 lbs.	$2.35	$2.35
Heads, per 100 lbs.........	2.65	2.95
Tank plates, 3-16 in.	2.60	2.60
Tubes, per 100 ft., 1 inch	9.50	8.50
" " 1¼ in.	9.50	8.50
" " 1½ "	9.50	9.00
" " 1¾ "	9.50	9.00
" " 2 "	8.75	8.75
" " 2½ "	11.15	11.50
" " 3 "	12.10	12.00
" " 3½ "	14.15	14.50
" " 4 "	18.00	18.00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Stove bolts	80 & 7½
Machine bolts, ⅜ and less	65 & 5
Machine bolts, 7-16.......	57½
Blank bolts	57½
Bolt ends	57½
Machine screws, iron, brass	35 p c.
Nuts, square, all sizes.....	4c per lb off
Nuts, Hexagon, all sizes..	4¼ per lb off
Fillister head	25 per cent.
Iron rivets	60, 10 p c off
Wood screws, flathead, bright	85, 10, 7½ p c off
Wood screws, flathead, brass	75, 10, 7½ p c off
Wood screws, flathead bronze	70, 10, 7½ p c off

National-Acme "Milled Products."

Sq. & Hex Head Cap Screws	65 & 10%
Sq. & Hex Head Cay Screws	65 & 10%
Rd. & Fil. Head Cap Screws	45-10-10%
Flat & But. Head Cap Screws	40-10-10%
Finished Nuts up to 1 in. ..	75%
Finished Nuts over 1 in. ..	72%
Semi-Fin. Nuts, up to 1 in...	75%
Semi-Fin. Nuts over 1 in.....	72%
Studs....	65%

Discounts f.o.b., Montreal.

WROUGHT IRON PIPE.

The following are Toronto jobbers' discounts on pipe in effect from April 21, 1913:

Standard	Buttweld Black	Gal.	Lapweld Black	Gal.
¼ ⅜ in.	62	47	....	....
½ in.	68	58	....	....
¾ to 1½	71½	61½	68½	58½
2 in.	71½	61½	68½	58½
2½ to 4 in. ..	71½	61½	70½	60½
4½ to 6 in.	....	....	71½	61½
7, 8, 10 in.	....	....	66	54

X Strong P. E.

¼, ⅜, ½in. ..	56½	46½	....	....
¾ to 1½ in. ..	67½	57½	....	....
2 to 3 in.	68½	58½	....	....
2½ to 4 in. ..	....	....	65	55
4½ to 6 in. ..	....	....	64	56
7 to 8 in.	....	....	55	45

XX Strong P. E.

½ to 2 in.	43	33	....	....
2½ to 4 in. ..	....	....	43	33

PRICES OF WROUGHT IRON PIPE.

Standard. Nom. Diam.	Price. per ft.	Extra Strong. Sizes Ins.	Price per ft.	D. Ex. Strong. Size Ins.	Price per ft.
⅛in	$ .05½	⅛in	$ .12	½	$ .32
¼in	.06	¼in	.07½	¾	.35
⅜in	.06	⅜in	.07½	1	.37
½in	.08½	½in	.11	1¼	.52½
¾in	.11½	¾in	.15	1½	.65
1 in	.17½	1 in	.22	2	.91
1¼in	.23½	1¼in	.30	2½	1.37
1½in	.27½	1½in	.36½	3	1.86
2 in	.37	2 in	.50½	3½	2.30
2½in	.58½	2½in	.77	4	2.76
3 in	.76½	3 in	1.03	4½	3.26
3½in	.92	3½in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4½in	1.27	4½in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.86	...	.....
7 in	2.38	7 in	3.81	...	.....
8 in	2.50	8 in	4.34	...	.....
8 in	2.88	9 in	4.90	...	.....
9 in	3.45	10 in	5.48	...	.....
10 in	3.20	....	....	...	.....
10 in	3.50	....	....	...	.....
10 in	4.12	....	....	...	.....

IRON PIPE FITTINGS.

Canadian malleable, 40 per cent.; cast iron, 65; standard bushings, 70; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 75; malleable, lipped unions, 65.

COKE AND COAL.

Solvay Foundry Coke	5.95
Connellsville Foundry Coke	5.45
Yough, Steam Lump Coal	3.93
Penn. Steam Lump Coal	3.63
Best Slack	2.95

All net ton f.o.b. Toronto.

OLD MATERIAL.

Dealers' Buying Prices.	Mont'l.	Tor'to.
Copper, light	$10 50	$11 50
Copper, crucible	12 50	14 50
Copper, uncr'bled, heavy	12 00	12 50
Copper wire, uncre'bled	12 00	12 50
No. 1 machine compos'n	10 50	11 50
No. 1 comps'n turnings	9 50	9 50
No. 1 wrought iron	10 00	9 00
Heavy melting steel	8 00	8 00
No. 1 machinery cast iron	13 00	14 00
New brass clippings	8 50	8 50
No. 1 brass turnings	7 25	7 80
Heavy Lead	3 25	3 90
Tea lead	2 50	2 50
Scrap zinc	3 25	3 50

METALS.

	Mont'l.	Tor'to.
Lake copper	$17.00	$16.00
Electrolytic copper	17.00	16.00
Spelter	5.95	5.55
Lead	5.75	5.15
Tin	45.00	40.00
Antimony	9.75	9.25
Aluminum	22.00	18.00

SMOOTH STEEL WIRE.

No. 6-9 gauge, $2.35 base; No. 10 gauge, 6c extra; No. 11 gauge, 12 extra; No. 12 gauge, 20c extra; No. 13 gauge, 30c extra; No. 14 gauge, 40c extra; No. 15 gauge, 55c extra; No. 16 gauge, 70c extra. Add 60c for coppering and $2 for tinning.

Extra net per 100 lb.—Spring wire; bright soft drawn, 15c; charcoal (extra quality), $1.25.

SHEETS.

	Mont'l.	Tor'to.
Sheets, black, No. 28	$2 85	$3 00
Canada plates, ordinary, 52 sheets	3 10	3 00
Canada plates, all bright.	3 70	4 15
Apollo brand, 10¾ oz. (American)	4 30	4 20
Queen's Head, 28 B.W.G.	4 40	4 40
Fleur-de-Lis, 28 B.W.G.	4 20	4 25
Gorbal's Best Best, No. 28	4 40	4 40
Viking Metal, No. 28	4 40	....

NAILS AND SPIKES.

Standard steel wire nails, base		$2 40
Cut nails	$2 60	2 65
Miscellaneous wire nails	75 per cent.	
Pressed-spikes, ⅝ diam., 100 lbs.		2 85

FINE STEEL WIRE.

Discount 25 per cent. List of extras. In 100-lb. lots: No. 17, $5; No. 18, $5.50; No. 19, $6; No. 20, $6.65; No. 21, $7; No. 22, $7.30; No. 23, $7.65; No. 24, $8; No. 25, $9; No. 26, $9.50; No. 27, $10; No. 28, $11; No. 29, $12; No. 30, $13; No. 31, $14; No. 32, $15; No. 33, $16; No. 34, $17. Extras net. Tinned wire, Nos. 17-25, $2; Nos. 26-31, $4; Nos. 30-34, $6. Coppered, 75c; oiling, 10c.

MISCELLANEOUS.

	Cents
Putty, 100 lb drums	$2.70
Red dry lead, 5 cwt. casks, per cwt.	6.00
Glue, French medal, per lb	0.10
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.26
Benzine, per gal.	23½
Pure turpentine	0.60
Linseed oil, raw	0.60
Linseed oil, boiled	0.63
Plaster of Paris, per bbl.	2.10
Plumbers' Oakum, per 100 lbs.	3.25
Pure Manila rope	17

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents.

Montreal, August 11, 1913.—Conditions generally remain unchanged from last week. Machinery dealers report that trade is as good as can be expected under present financial conditions, and that is the best that can be said. Tenders have been submitted on part of the equipment for the plant which is to be erected for Armstrong , Whitworth & Co., at Longueuil, but it will probably be some considerable time before a decision is reached in this matter.

Metals.

Pig iron shows a firmer tendency this week though no very large sales are reported. The slight rise in price is largely due to the difficulty United States furnaces are now experiencing in obtaining regular supplies of Lake Superior ore owing to the strike in that district. They have had to advance their prices, thus enabling Canadian producers to do the same. Copper continues firm, and both lead and tin are improving. The present low price of old metals hardly reflects the true state of that market, for the demand is fairly brisk, but the price is being kept down by the existing money stringency. In an effort to raise some ready money, many large wholesale hardware houses, machinery dealers, etc., are selling off old stock for scrap. For this scrap, the old metal dealers can only afford to give a low price, because the majority of their large customers are now taking 40 to 45 days to settle accounts which are customarily paid in 30 days. On the whole, trade in Montreal is fairly good, even if it is not showing any great increase in volume just now. The general feeling with regard to the future is one of confidence, and orders are about as good as they were at this period last year

Toronto, August 12.—While the condition of the steel and iron market is improved, the market for both contractors' supplies and machine shop equipment still keeps quiet. The A. R. Williams Co., Toronto, are busy removing their stock across the road, on Front Street, and in a week's time, the G.T.R. will begin the demolition of the vacated premises.

Pig Iron, Etc.

Inquiries for pig iron have been coming in quite freely during the past week, especially from stove manufacturers who, apparently, are preparing for good business this fall. Prices remain firm at the mills, and no inducements are being given to manufacturers to place orders. The representative of a big Canadian steel firm ventures the prediction to-day that sixty days would see a decided improvement in the steel and iron business, and a loosening up of money. Holidays just now seem to have a deleterious effect on business generally. The Steel Co. of Canada report inquiries good, that bars especially are keeping up well, and that prospects are rosy. Canada Steel Co. new rod mill at Hamilton was partly destroyed by fire last night, the damage amounting to $20,000. Besides the mill, much damage was done to the machine shop and blacksmith's shop.

Miscellaneous.

The price of iron and brass wood screws dropped 7½ per cent. recently. The sales of wire remain small, and no changes in price have taken place. The Dominion Steel and Iron Co., of Sydney, C.B., have arrived in town with their second and third line. Up to the present they have carried only nails. They now have a stock of wire, barbed, and galvanized, at their depot, as well as a supply of steel bars. Mr. Max Morrell, their Toronto representative will shortly make a bid for local business in these lines.

Metals.

Little can be said this week of the metal market. Prices are stationary, and business generally is good. Stocks visible and floating, remain the same, so that these prices should continue for the next month or so. Copper might improve, and the price of lead must go higher if the Mexican trouble continues as the stocks are being rapidly depleted. All metals are in fair demand locally.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Engineering

Medicine Hat, Alta.—J. E. Davies, manager of the Alberta Foundry & Machine Co., is considering extensions to the plant.

Weyburn, Sask.—It is currently reported here that the C.P.R. have purchased a site of twenty acres at this point on which to erect shops.

Montreal, Que.—The Ford Automobile Co., of Canada, Walkerville, Ont., will build a four-storey automobile factory, plans for which are being made.

Hamilton, Ont.—Lightning destroyed a machine shop on the dock of the Inland Lines, Saturday, August 9. The loss, $9,000, was covered by insurance.

St. John, N.B.—Geo. Wetmore, King St., St. John, N.B., will purchase all new equipment for a large machine shop being built for the C.P. Ry. at McAdam Junction, N.B.

Montreal, Que.—The Board of Commissioners have called tenders to build a boiler house at the Low Level Pumping Station, Point St. Charles. L. N. Senecal, secretary.

London, Ont.—The London Foundry, in which Mr. D. J. Cowan and other prominent financiers are interested, has been disposed of to a St. Catharines, Ont., firm, who will manufacture automobile parts.

Sarnia, Ont.—The Loughead Machinery Co., has decided to build a big addition to its present plant. The company recently entered the machinery field, and intends to erect a plant on the river bank, and cater to the marine trade.

Electrical

Calgary, Alta.—For the seven months of the present year the gross earnings of the Calgary Power Co., Limited, amounted to $127,591.47, as compared with $92,939.25 for the same period of last year.

..**White Rock, B.C.**—Electric light and power will shortly be added to the modern conveniences of White Rock, the B. C. E. R. having undertaken to run a pole line to supply current to the C. L. R. Co.'s two mills and the residences.

The Cape Breton Electric Co. are rushing their new concrete sub-station at Reserve. It will contain two large transformers and one generating set, and will be used for supplying power for Glace Bay and the tram line. The idea of the company is to close down their power houses at Glace Bay, and to do all the generating at the Sydney plant.

Ottawa, Ont.—The E. B. Eddy Co. is constructing a new power house and pulp mill in Hull at a cost of about $750,000. When the new power house is finished, the company's horse-power will be increased from 8,500 to between 16,000 and 18,000. The water power is being converted into a hydro-electric system. The company is also deepening and enlarging the fore bays and intakes of its plant, and increasing the draft tubes.

Aurora, Ont. — The electors carried both the money by-laws submitted to them recently. The first authorized an expenditure of $16,000 on new electrical equipment, while the second was for $5,000 to be spent on new pumps for the waterworks. The election finally disposed of the power question at Aurora for five years at least, that being the extent of the municipalities' agreement with the Metropolitan Railway Co. for power supply.

Sherbrooke, Que. — The recent acquirement by the city of the Lomas water power in the Magog river, above the present power station, opens the way for a further development of city power. The dam at the present electric light station can now be raised ten feet and it is estimated that this will give about 500 h.p. additional. The cost of development wil l amount to about $25,000. This will be, in all probability, the next power development work undertaken by the city, the development of Westbury being deferred to meet later requirements.

Stave Falls, B.C.—The Western Canada Power Co., Ltd., are engaged in raising the dam at Stave Falls, B.C., extending the power house, and doing other work necessary for the increase of the capaciay of the plant from 25,000 to 50,000 horse power. Contracts for the necessary machinery and equipment for this purpose have been made with Escher, Wyss & Co., of Zurich, Switzerland, for the turbines; with the Canadian General Electric Co. for the generators, and with the Canadian Westinghouse Co. for switchboards, etc. O. B. MacCallum, Secretary.

General Industrial

Oakville, Ont.—The ratepayers will aid James Langmuir Co., Ltd., to build a paint, oil and varnish plant here.

Campbellton, N.B. — The St. Lawrence Pulp & Lumber Corporation, Campbellton, N.B., will erect a sulphite mill.

St. John, N.B.—The flour mills of J. Harvey Brown, 2 Mill St., St. John, N. B., destroyed by fire, with a loss of $25,000, will be rebuilt and new machinery installed.

Calgary, Alta.—An English manufacturer through Messrs. Boyd, Faunt & Swain, has asked the city what offers it can make to induce him to erect a plant employing 1,000 persons.

Alliston, Ont.—The Defriez & Woodman jewelry manufacturing plant here has been purchased by Benedict & Proctor, Syracuse, N.Y. It is rumored that the factory will be considerably increased in size.

Shawinigan Falls, Que.—An extension to the paper mill, of The Belgo-Canadian Pulp & Paper Co., is planned. Plans and specifications are being prepared by the owners for both buildings and machinery. Machinery contracts may not be let until end of the year.

Calgary, Alta. — The Dominion auto garage was swept by a disastrous fire Aug. 4. Fifteen motor cars, a number of motor-cycles and the whole interior equipment of the buildings was destroyed. The total loss is estimated at $50,000.

Bridgeburg, Ont.—A new company to be known at the International Color & Chemical Co., Limited, has been organized at Bridgeburg, with a capital stock of $100,000, to handle certain patents for process of making paint without the usual grinding dry and grinding in oil methods now in use.

Prince Albert, Sask.—The paint factory of the Great West Iron, Wood & Chemical Co., established in Prince Albert, is now in full operation with a plant capable of turning out 1,000 gallons of finished products per day. The factory is a four-storey building 100 ft. x 150 ft., and contains the most modern machinery.

Montreal, Que.—Fire broke out Aug. 6 on St. George street in the premises of the Continental Upholstered Furniture Company, and swept through F. A. McReay's iron works, the United Paper Box Factory, and did considerable damages to the adjoining premises of V. C. Fuller and Jas. Cleveland, dye works, before the firemen could get it under control. The loss is in the neighborhood of $35,000.

Toronto, Ont.—Construction work is going on rapidly at the new brick and tile factory which the Provincial Government is building at Mimico. Completion will mark the advent of the Government into a new industrial field. An estimate of the producing capacity of the new factory gives a maximum daily output of 25,000 bricks. This is, however, slightly above the average, which will be about 20,000 per diem.

Sarnia, Ont.—Freight Traffic Manager Dewey and General Superintendent Wittenberger, of the G.T.R., were in Sarnia recently regarding the construction of a new elevator at Point Edward to replace the building recently destroyed by fire. Mr. Dewey stated that prospects were bright for the immediate construction of a much larger elevator than the one recently destroyed. The new building will be of concrete and steel, and will be absolutely fireproof.

London, Ont.—Work commenced last week on the erection of a new plant for the London Brick & Tile Co., which within six weeks will have a staff of from 20 to 30 men at work producing pressed bricks of various colors, roofing and floor tile and kindred products. It will have capacity for 20,000 bricks per day. The machinery building will be two stories in height, and will be 36 feet by 45 feet. The cylinder shed in which the pressed bricks are given their final course of the process, will be 85 feet by 36 feet.

Trade Gossip

Vancouver, B.C.—The Amalgamated Dry Dock and Engineering Co. is the name of the concern applying for a subsidy for a floating dry dock at Vancouver, to cost $2,500,000. It will be of the second class.

Toronto, Ont.—Luther Grinder Mfg. Co., Milwaukee, Wis., have opened a branch house at 126 Wellington Street W., Toronto, in charge of S. D. Burroughs, formerly sales manager at the home office. Within a few months they expect to build a branch factory, where they will assemble and manufacture all goods for Canadian trade.

West Indies Cable Rate.—As a result of the new subsidy arrangements toward which Canada contributes $40,000 a year, the new cable rate between Canada and the West Indies Islands will be 36 cents a word. The present rates are: To Barbadoes, 91 cents per word; St. Kitts, 89 cents; Trinidad, 98 cents; Bahamas, 45 cents; Bermuda, 42 cents.

British Trade Returns. — The July statement of the British Board of Trade shows increases of $17.436,500 in imports, and $25,880,000 in exports. The imports of foodstuffs increased $8,875,000, and raw materials about $5,000,000. The principal gain in the exports was in manufactured goods, which showed $20,000,000 more than a year ago, including $5,000,000 in cotton textiles.

Gaspe Bay Oil Possibilities. — Viscount Selby, chairman of the Eastern Canada Co. has the highest hopes of the oil-producing possibilities of the Gaspe Bay district. Shipping facilities there, are, he says, admirable. In view of the increasing attention being given to the adoption of oil in the Royal Navy, and the decision of the Government to secure supplies as far as possible within the British Empire, there opens up the prospect of another large Canadian industry.

Westinghouse Machine Co. — The Westinghouse Machine Co. May and June monthly shipments approximated $500,000, and in July $600,000. Orders at present warrant expectation that business for balance of the year will average $500,000 a month. Such a condition at this season is unusually gratifying, as summer months are usually dull. An official says: "I think I am justified in the assertion that the outlook assures net profits of $1,000,000 or more during the current year. The Westinghouse Machine Co. has entered contract to supply the Interborough Rapid Transit with three turbo-generator sets of 30,000 kilowatts each. In addition, they are constructing at Pittsburgh 14 generators ranging from 15,000 to 22,000 kilowatts each, and many others ranging from 5,000 to 10,000 kilowatts.

Contracts Awarded

Coniston, Ont. — The Riter-Conley Manufacturing Co., Pittsburg, has received a contract from the Mond Nickel Co. of Coniston, Ont., for a sintering plant.

Regina, Sask.—The City Commissioners have awarded Bruce, Peebles & Co., Ltd., Edinburgh, through their Eastern Canadian agents, the contract for supplying a 1,200 K.W. motor generator.

Bridgeburg, Ont.—The Turner Construction Co., 11 Broadway, New York City, has received the general contract for the erection of a two-story and basement reinforced-concrete factory building 60 x 80 ft. for the Mentholatum Co.

New Westminster, B.C.—The contract for the completion of the first unit of the north jetty at the Fraser river sandheads has been awarded to Broley & Martin, of New Westminster and Vancouver. The contractors agree to complete the jetty for $83,500.

Water-Works

Duncan, B.C.—The town will borrow $25,000 to purchase the plant of the Cowichan Waterworks Co., Ltd.

West Vancouver, B.C.—The corporation will borrow $100,000 to spend on a waterworks system.

Wood Working

Port Coquitlam, B.C.—A company in which L. W. Hookham, late designer for Woodcrafts, Ltd., Calgary, holds the main interest, is establishing a show case and cabinet factory on Railway Ave.

Cranbrook, B.C.—The Standard Lumber Co. mill, two miles south from here, and one of the largest in the district, with a daily output of thirty thousand feet, has been totally destroyed by fire. The cause is supposed to have been a hot eccentric on an edger machine. The loss is estimated at $35,000, partially insured.

Charlottetown, P.E.I.—On Aug. 3 the sash and door factory and woodworking mill of H. P. Hogan on the Steam Navigation Co.'s wharf, was totally destroyed; loss $25.000, no insurance. Bruce, Stewart & Co.'s foundry and machine shops adjoining had a close call. The Hogan mill was built twenty years ago and was well equipped with machinery.

Liverpool, N.S.—The large box factory of the Sable Lumber Company at Wilkins's Siding, eighteen miles west of Liverpool, was destroyed by fire and 300,000 feet of lumber in the factory was burned Aug. 1. One H. & S. W. box car, one of the I. C. R., and several of the lumber company's flat cars were burned. The loss will be fully $50,000.

Problems To Be Considered By Manufacturers Looking For A Suitable Plant Location

By C. W. BYERS

ALMOST every week there come to Canada American or British manufacturers seeking a location for a branch factory. They make a thorough examination of the most attractive centres, always having in mind the most convenient spot to which to draft their raw material, manufacture their product, and distribute to the consumer. Many concerns must locate between two given points—say, Windsor and Montreal, so that, if their plant is in the United States, east of Detroit, communication between the parent and the branch plant will be easy. If the headquarters are further west—say, in the vicinity of Chicago or Indianapolis, then a Western Canadian city is likely to be chosen. Depend upon it, however, the firm seeking a site for a plant has an idea in what province it will locate, and only extraordinary inducements will alter its decision.

Independence of Industries.

The supply of raw material has an important bearing on the choice of location. Some months ago, a Pittsburgh manufacturer came to this country in quest of a site. He had no particular city in view, in fact, he passed from one to another haphazardly. His limits were the Detroit River and Montreal, but there was this important stipulation:—the plant must be located within easy distance of a malleable iron foundry where he could obtain castings for his product. Thus, his choice was narrowed down to less than a dozen cities. Here we have an instance of one industry bringing another, and it is the multiplicity of industries, that has aided such cities as Hamilton, Brantford and Windsor to secure additional and subsidiary plants to help increase their population and wealth. A town that secures an iron industry is laying the foundation for scores of others which will follow in its wake.

Parent and Branch Plants.

Windsor as a manufacturing town from a geographical point of view, is perhaps more fortunate than Hamilton. The latter city has credited cheap power chiefly for its success in securing new industries. Windsor is a common sense location for firms operating in Detroit, and numerous firms, particularly Ford, the automobile makers, have put up large branch plants on this side the Detroit River, either in Windsor or in one of its many thriving suburbs. Nine motor car companies are established

KAKABEKA FALLS, PORT ARTHUR, ONT.

there, most of them branches of American concerns. Thus, the proximity of the branch plant to its parent is one of great importantce.

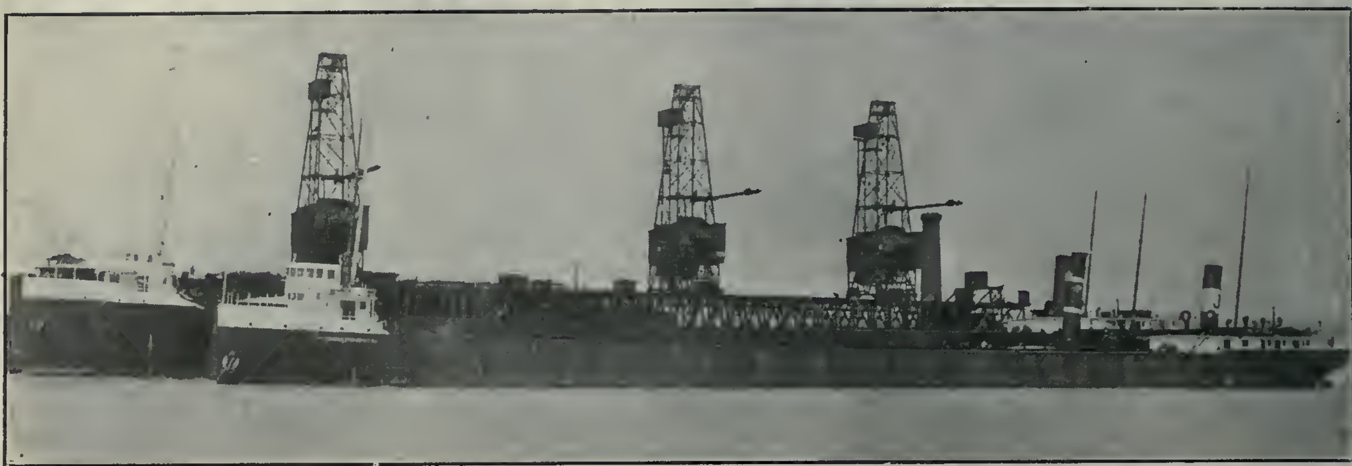
Municipal Inducement Feature.

Judging from recent examples, the prospective builder is influenced by circumstances that do not count for much in the long run. There have been firms who located in the city which gave them a free site and tax exemption for a number of years. Some cities go further, and offer water and power at ruinous rates. This procedure results in foolish competition among the various municipalities. There was one notorious case this year of an immense corporation going around looking for the best offers, but they have not located yet. Time and again it was reported that some city had landed them, and by-laws were passed.

One of the best known industrial commissioners in Canada, speaking to the writer on this subject recently, said: "Subsidies are all right to build a town, but this practice does not always work out well. Small towns are often 'stung' by corporations who have been granted bonuses. My belief is that a firm which cannot stand on its own legs is not worth going after. Our best industries were not secured that way. The manufacturers come to us saying they did not wish to be given something for nothing; all they wanted was to be assured that they would not be overcharged for their site, etc. It is the work of an industrial commissioner to see that firms coming into his city are protected. He can help them in scores of ways; by securing options on property, for instance."

Essentials of Business Success.

The city of Indianapolis in a pamphlet on "Six Essentials of Successful Manufacturing," states the following main factors upon which business success depends: Shipping facilities, power, labor, raw material, market and living conditions. It says: "The availability of a factory site cannot be judged solely by the excellence of its shipping facilities, for it may be correspondingly weak in fuel and labor. It cannot be fairly judged by any one factor, or by any two or by any three. It must be judged by the strength of the entire six factors in combination."



The Power Feature.

One of the most important of these is **power.** If the prospective industry is of any account, it will require machinery of some kind or other, and power to run it. The form in which power is available will determine to a large degree the size of plant and the amount of equipment necessary.

Water Power.

Many cities are in the neighborhood of water power which can be transmitted over long distances and supplied cheaply. Such cities are in enviable positions. Other towns, like Thorold for instance, abound with water powers of sizes suitable for individual establishments. This accounts for the tremendous strides made in recent years by the towns of Thorold and Merriton, which seem to be the Mecca for papermaking industries, in particular. Pilkingtons Ltd., the English glassmaking firm, no doubt, selected Thorold because of its remarkable facilities for supplying cheap water power.

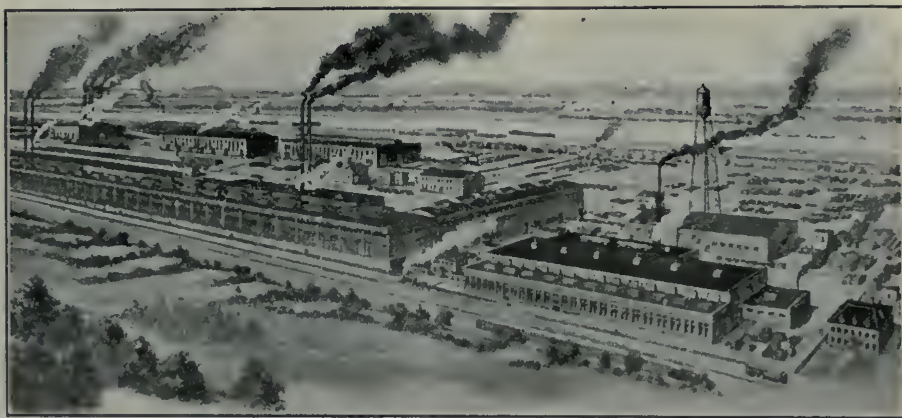
Towns like Owen Sound and Guelph have their own electric power plants, and are able to supply it to manufacturers at as near cost as possible. The advent of the Ontario Hydro-Electric Commission placed those towns within its belt in a position to make favorable terms to American manufacturers contemplating the erection of branch plants. Many a town in Ontario which hitherto had nothing to commend it, has been able to boost itself as a place where cheap power is available. Cities like Brantford and Windsor which, by their very position and enterprise became admirable centres for manufacturing purposes, have considerably enhanced their attractions by securing favorable terms from the Hydro-Electric Commission.

Natural Gas For Power.

Natural gas has played a prominent part in Canada as a fuel, and many cities unable to boast of their electric power, have been able to carry as much weight in their offers by quoting reasonable rates for natural gas. Windsor, Ont. besides having cheap electric power, supplies natural gas at 12 cents per 1,000 ft. which is equal to coal at \$2 a ton. Brantford charges 40 cents for the first 8,000 feet used, and 35 cents for succeeding amounts per month. Calgary estimates the cost of its gas at \$12 per h.p. per annum. London charges 80 cents for illuminating gas used for manufacturing purposes.

Coal.

The question of coal enters largely into the situation. For, if water power or natural gas are not available, a steam power plant with coal fuel becomes necessary. For that reason, most towns and cities in their advertising literature, take care to state how near they are to the coal fields, and the price of coal. Edmonton makes much of the fact that there are coal beds containing 60,000,000 tons of coal directly under the city, that thirty mines are operated, and that coal is sold as low as 75 cents a ton for steam purposes, and \$4.50 a ton for domestic purposes. Welland advises firms locating there to charter a steamer to bring coal across Lake Erie at a



PLANT OF CANADIAN CAR & FOUNDRY CO., LTD., MONTREAL.

VIEW OF THE WESTERN DRYDOCK AND SHIPBUILDING CO. PLANT, PORT ARTHUR, ONT.

CLOSE VIEW OF BLAST FURNACE, PORT ARTHUR, ONT.

saving of 35 cents a ton on the ordinary prices in Welland. The price of coal in Canada is such a variable quantity that many cities do not venture to quote prices.

The second point to be considered by a manufacturer locating is the shipping facilities. That this feature is appreciated is easily seen by a glance at some of the literature sent out by industrial commissioners. The pamphlet sent out by Windsor has a cover bearing an attractive map showing the numerous railways which pass through it en route to the east and west, as well as the steamship routes by way of the Lakes. This, Windsor considers "The Logical Location," because of its marvellous shipping facilities. The city of Sherbrooke, Que., includes among its literature a single sheet map of the surrounding district on a large scale, which is very striking. It is easy to see at a glance that Sherbrooke is in the midst of a very populous district, supplied plentifully with railways, and in close proximity to the New England States. These points are emphasized by the city of Sherbrooke regarding its shipping facilities. It is within a night's ride of all New England points, making it possible for head office officials to visit their Canadian branches often and with a minimum loss of time. Sherbrooke is the Canadian terminus of the Boston & Maine, and through trains are run from both Boston and New York. It is on the trunk lines of the C. P. R. and G. T. R. and contains the head office of the Quebec Central Railway.

PLANT OF THE PLYMOUTH CORDAGE CO., WELLAND, ONT.

ST. JAMES AND McGILL STREETS, MONTREAL, WITH EASTERN TOWNSHIPS BANK BUILDING ON THE LEFT.

An American firm who located in Owen Sound last year, told the writer that they chose that town because of the excellent facilities provided for reaching the Western trade by water. The same argument might be put up by firms in Sarnia, Windsor, or Midland, for all these are situated on Lake Huron, and are within easy distance of Fort William and the West. Many eastern firms, including some from the Maritime Provinces, have recently erected branch plants in Fort William and Port Arthur, thus being hundreds of miles nearer the West, but many of these were firms who owned factories in the East which were able to take care of the more important trade of Ontario and Quebec.

In the case of large plants which require to import enormous quantities of raw material, it is essential that their location be in a town with a good harbor having good docking facilities. It will be interesting to note what some towns offer in this respect. Take Three

Rivers, Que., which among its industries boasts of the Canada Iron Corporation Ltd., employing 300 men. This town has a wharfage a mile in length, with a basin 400 x 1,500 feet, capable of receiving the largest ocean crafts. The wharf has a surface area of 700,000 sq. ft., with permanent as well as movable sheds, and sufficient railroad sidings to accommodate large incoming and outgoing cargoes. Besides this, the shipping facilities are augmented by the C. P. R., G. T. R., I. C. R., St. M. V. R., and the S. & H. R., which run 35 trains daily. The R. & O. Navigation Co. also run a day and night service, while an electric railway is also projected.

One of the reasons why Welland has received so many large industries in the last few years is because of its location on the Welland Canal, its nearness to Buffalo and other American cities bordering on Lake Erie, as well as to Canadian cities served by ports on Lake Ontario. Welland is also favored with a wonderful system of railways. Its great rival in this respect is Port Colborne, located at the mouth of the canal on Lake Erie. The chief reason why the Buffalo Furnace Co. went there was because of its exceptional shipping facilities by water. The same advantages may be claimed by Thorold, Merriton, and St. Catharines, the first of which has the additional attraction of an abundant supply of water power.

Here again, care must be taken not to attach too much importance to one link in the chain, for, whereas some towns by their geographical position have unrivalled shipping facilities, yet are they seriously lacking in others of the essentials which go towards profitable manufacturing. One of the towns just mentioned is lacking lamentably in a particular regard, and firms who have located there, have since regretted their action because of their inability to obtain suitable houses for their workpeople. So serious was the situation, that certain firms refused to build until assured that the situation would be relieved. One large firm in particular launched out on its own, and erected hundreds of cottages for its employees.

LAURENTIDE PULP AND PAPER CO. PLANT, GRAND MERE, QUE.

DOG LAKE FALLS, PORT ARTHUR, ONT.

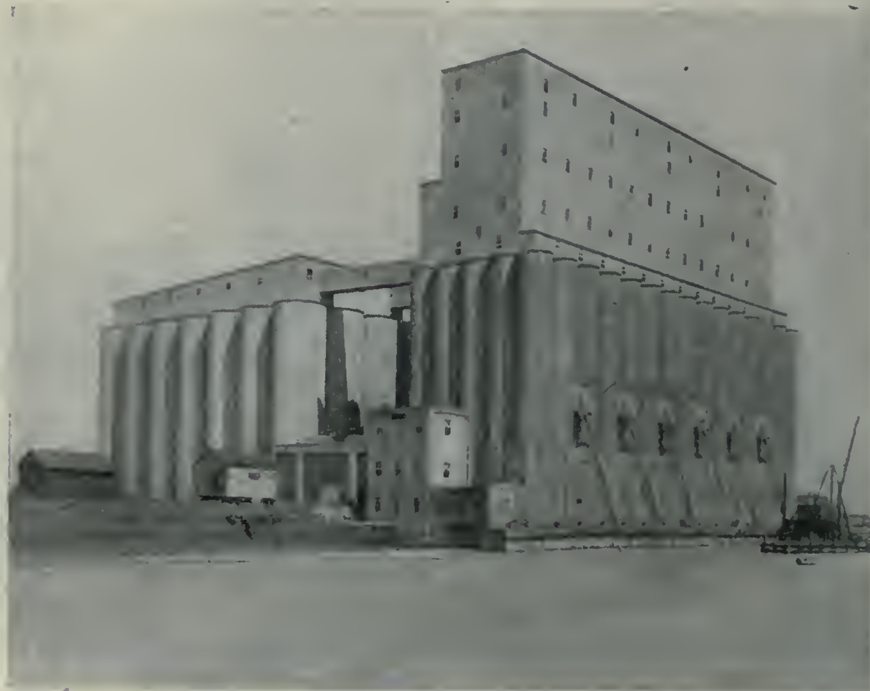
Railroad Spur Lines.

Before leaving the subject of shipping facilities, it will be apropos to refer to sidings and spur lines which naturally come under this heading. Some time ago when "Canadian Machinery" was aiding an American firm to secure a two-storey building for manufacturing purposes, it was noticed that many of the buildings for disposal were not situated near sidings. In many cases it would have been necessary to truck the product for a considerable distance. To a firm, however, who are willing to build, sites are available in every progressive Canadian town, near to sidings. In many Ontario towns, particularly those around Galt, this work is done by the electric railways, which are very plentiful.

Markets.

The product to be manufactured determines to a great extent the location of the plant. Other conditions being satisfactory, it is safe to say that the factory should be as near as possible to the consumer. When the market is a big one, and evenly distributed across the Dominion, it is often found cheapest to establish several plants, covering several territories. The Steel Company of Canada do not confine their activities to Hamilton. They have plants in Toronto, Belleville, Montreal, and are now erecting one at Fort William which will assist them to cater to the West.

Roughly speaking, the Canadian market is divided into three sections—the Maritime Provinces, the West, and the heart of Canada, which extends from Quebec to Fort William. It is because of Ontario's central location that the largest percentage of industries are located within its borders. The same conditions exist across the border, though to a less marked extent, and it is only natural that branches should be located on this side as near the parent industry as possible, yet in a position to look after the market from Vancouver to Halifax. It has often been remarked that the industries landed by Western cities are those which cater to a market which is more or less local. The market usually is where the people are, and that is in central Canada. If this argument holds good, then the large industries which are coming to Canada in the next ten years, are coming to Ontario and Western Quebec. In several notable cases where the product finds a Western market, the headquarters are centrally located. Take the manufacturers of harvesting machinery for instance: The largest are in Hamilton and Toronto. In the United States the centre of population and manufactures has moved steadily westward, past Pittsburgh, and is now located somewhere near Indianapolis. The same has been happening in the Dominion of Canada, though the movement of this centre has been later and perhaps more gradual.



GRAND TRUNK PACIFIC ELEVATOR, FORT WILLIAM, ONT.

For many years Montreal must have been the manufacturing hub of Canada, but with the development of the West in the last thirty years, and the enormous industrial expansion around Port Arthur and Winnipeg, the centre has travelled westward, until to-day the true centre must be nearer Toronto than the Metropolis. Visitors to Montreal are impressed by the dense population within that city's limits, yet nowhere in Canada can we meet with such a largely populated area as is to be found along any radius from Toronto extending north, south, east or west.

That the Canadian market is enormous and undeveloped is made evident every day. The British manufacturer who has been rather tardy compared with his American cousin in plucking the plums, is now coming across with his incomparable wares, and is meeting with success. Handicapped by long distance, he has first established a hold, and is now aggressively following up with

VIEW OF DRYDOCK, WESTERN DRYDOCK AND SHIPBUILDING CO., PORT ARTHUR, ONT.

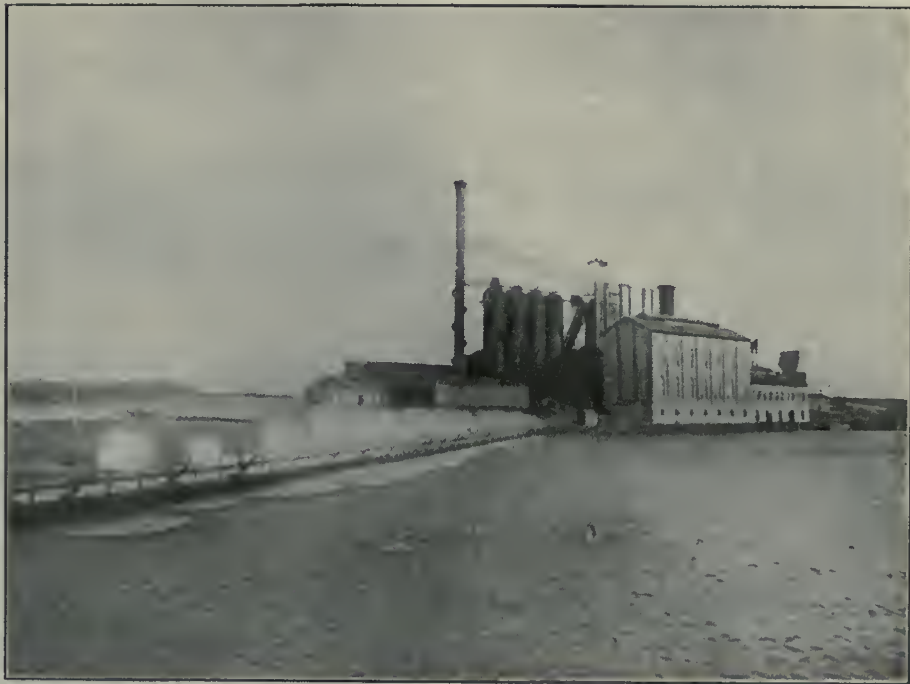
branch plants. Recent developments show that the Canadian City seeking new industries must pay attention to firms both in Great Britain and the continent of Europe, many of whom are on the verge of new departures.

The subject of **market** is one neglected by industrial commissioners in compiling their literature. True, it is an elusive and difficult subject to handle, yet one of vital importance to the manufacturer who desires to know what chance his product has for sale in that particular district. Much will depend on other industries already in the locality, and the class of people who compose the population. For this reason the method adopted by Welland of providing a list of articles manufactured within its limits is a good one. In a manufacturing city, there is often an opening for subsidiary concerns who will find a ready market for their parts which formerly were imported. The writer noticed an instance of this in Levis, Que., recently; where, a foundry was opened to make castings in iron, aluminum and brass for the local shipyards and engineering concerns.

Raw Material.

What effect this subject has on the location of industries is clearly seen in the iron trade, the most important industry on this continent probably. Iron ore has not been developed to any extent in Canada as yet, although geologists claim that there is plenty of it in certain districts. The majority of the iron ore used in this country is imported from the United States, and for that reason development along the line of blast furnaces has not been very rapid. The tendency seems to be to manufacture pig iron on the American side, and to import it. In the iron industry then, pig iron becomes the raw product, and manufacturers when considering the location of a new plant, must take this matter into consideration. It is then that the question of shipping becomes important, and this is one of the secrets of the success of such cities as Windsor, Hamilton, Welland, Fort William and Port Arthur. It is very clear why such places swallow up the leading iron industries that come to this side. The situation will be complicated, however, by the advent of the United States Steel Corporation and the Buffalo Furnace Co. of Port Colborne, etc., who will breathe new life into the manufacture of pig iron.

Nova Scotia and New Brunswick have reason to be thankful for the fact that they are within easy reach of Newfoundland, from whence comes a large percentage of the ore used in the iron and steel industries of the Maritime Provinces. Sydney is a splendid instance of the importance of having raw material near at hand. If only these provinces had the population of Ontario with its multitude of industries, that part of Canada would quickly become to the Dominion what New England is to the United States. As it is, Sydney, situated at the extreme of Cape Breton, is handicapped in its effort to secure the trade of the hub of the Dominion. That it intends to have its share of the market is shown by the recent move of the Dominion Iron and Steel Co., who have established depots in Toronto and Western Ontario, and have already made serious inroads into the iron and steel trade. Particularly is this true of nails and wire, for which there is a tremendous demand from the West, supplied until now chiefly by American and Ontario manufacturers.



BLAST FURNACES, NOVA SCOTIA STEEL AND COAL CO., SYDNEY MINES, CAPE BRETON.

Manufacturers who attach more importance to the subject of raw material than to market, railway facilities and labor, will be inclined to favor inland towns where the particular raw material required is plentiful. This is not true in every case. There is at present being erected in Thorold, Ont., one of the largest paper mills on the continent — that of the MacCormick interests, of the Chicago Tribune. The pulp wood re-

C.P.R. FREIGHT YARDS AT FORT WILLIAM, ONT.

quired for this plant will be shipped from the Island of Anticosti. Many large paper manufacturers, however, have chosen to build their plants right at the source of supply, which is resulting in a large ingress of capital to the district surrounding Three Rivers, Que.

Publicity literature should contain a clear cut statement of what raw material is available right at hand, and care should be taken not to compile a list of materials that are not readily available, except when accompanied by a clear explanation of how they may be secured. The statement made by the industrial commissioner of Ottawa has, in this respect, an honest, business-like ring about it:

"For woodworking, paper-making, and kindred industries; raw materials are available in the city and within easy access. Timber and other materials abound throughout the district. These include, ash, apatite, beech, basswood, birch, barite, corundum, clay, cedar, elm, granite, graphite, iron, hemlock, limestone, marble, marl, mica, maple, magnesite, peat, pine, poplar, phosphate, sand, water."

Those who know Ottawa will agree that this statement is not exaggerated; in fact it is almost an underestimate. In that list there are several items that are almost negligible, yet there are others which mean so much to the life of Ottawa, they should be put in big, bold type.

The town of Sault Ste. Marie, Ont., was asked to furnish a list of raw materials and replied in the following modest terms:—

"We have an abundance of raw material in the way of all classes of lumber, and there are large deposits of iron ore in the immediate vicinity. The Algoma Steel Corporation would be in a position to furnish such steel products as would be considered raw material for other lines of manufacture."

Winnipeg claims the follows: Grains of all varieties for flour and cereals, wool, flax seed, sugar beets, hides, clay, straw, limestone and sand; iron deposits, on water navigable to the city, gypsum, peat, salt and manganese.

The Labor Feature.

The supply of labor is a problem which Canadian manufacturers have been compelled to battle with for years. Various cities will tell you they have an unlimited supply of labor, skilled and unskilled; mostly unskilled, might be added, for the new manufacturer usually has to turn in, and train a staff of men to do his work. It is a natural condition in a new country. A prominent Canadian shipbuilder was speaking to the writer recently of labor conditions, and expressed the heartfelt wish that conditions would soon improve. He gave several instances of expert workmen coming to this country from British shipyards to whom he was willing to pay six and seven dollars a day. They stayed with him for a year, and just when they had become indispensable, an American shipbuilder came along and offered them ten dollars, which to the Canadian was a prohibitive price.

The tendency for many years has been for skilled workmen to pass across the border into the United States where wages are slightly higher, although of late there has been a dropping off in this practice, Canada having reached a point where she can offer inducements almost equal. Nevertheless, the most profitable method for a new manufacturer to adopt is to thoroughly drill his raw recruits in his work, and thus create his own skilled labor. In the end, if he is able to retain them, he has a more reliable and cheaper staff of employees than if he had scoured the country for experienced hands. Such employees as a rule are more faithful to a firm than those who have known the fruits of their skill for many years.

American Workmen Don't Settle.

It is customary for American firms establishing branches in Canada to transfer a portion of the men from the parent shop, and to use these to train the raw material obtained in Canada. It has been found, however, that men who have been used to the noise and bustle of American cities, soon sicken of the new country and, find their way back to the old haunts, leaving the manufacturer hopeless and exasperated.

Trade unions have been organized in Canada, followed ultimately by labor disputes aggravated by the importation of new labor, but Canada has been exceptionally free from long drawn-out strikes characteristic of the older countries. Labor disputes are usually short-lived, and generally end in an amicable arrangement between the masters and men in a very short time.

The Province of Quebec is one of the most productive sources of labor supply in Canada. The population is large and increasing at an enormous rate. During the past fifty years there has been a considerable exodus of textile and other workers into the New England States, but this has almost ceased now owing to the growing attractions on this side. The French-Canadian will work for a reasonable wage, he is industrious, and is not prone to disturb the industrial peace. Once he has been trained, he can usually be depended upon. It is stated that Three Rivers, Que., although employing thousands of operators in its combined industries, has never had a strike.

Living Conditions.

Workmen's houses, streets, recreation grounds, public libraries, schools, churches, etc., are things which concern the manufacturer indirectly. Some months ago the writer drew attention in "Canadian Machinery" to the fact that a growing Ontario town failed to secure a large steel industry, even when that town had practically been decided upon as the most suitable location. Before arrangements had been finally completed, however, several of the firm's foremen brought their wives over from the American side to see their new home. When they saw the place, an objection was raised—a woman's objection—that could not be overcome. In the end, another town was chosen hundreds of miles away, which contained comfortable cottages, well paved streets, and better living conditions.

It is an indisputable fact that if a manufacturer is to get the best out of his workmen, he must see that their lives are happy and healthy. There are several notable examples in England of large concerns planning model cities in which it is a pleasure for the working man to live. It is significant that these were corporations which went ahead and prospered, and were seldom troubled with industrial disturbances. A firm which would look after the welfare of the man in his home would not be unjust in the matter of wages.

There are many instances of welfare work of this kind being carried out successfully in Canada, as well as in the United States. Atention might be drawn particularly to the model cottages erected by the Plymouth Cordage Co. of Welland, Ont. They are of frame construction, semi-detached, although perhaps rather sombre in appearance, the timber used being dark in color. This is relieved somewhat by the green shutters, and white porches. The lawns are extensive and neat. Among the cottages are interspersed large boarding houses of similar design, which must cheer the heart of the laboring man who is used to something quite different. A considerable area is laid out around the Plymouth Cordage Co.'s works, the streets being of considerable width. The scheme makes this plant and this district like a paradise, and contrasts favorably with other sections of the town.

The dearth of workmen's houses has become so acute in several Ontario towns that steps have been taken by semi-philanthropic corporations to invest large sums in erecting frame dwellings, containing modern conveniences; to be rented to workingmen at reduced rates. Such a company was organized in Toronto recently with a capital of over a million dollars.

Civic Publicity: A New Profession in City Development

By B. L. C.

With the wave of publicity which has swept over Canada in the past two or three years, there has been created a new profession—that which embodies publicity promoters. The profitable way in which large cities have utilized the services of these men in publicity campaigns is herein set forth. Not alone has the work been confined to cities; provinces have also launched into it.

CIVIC PUBLICITY has come to be a recognized factor in the growth and expansion of urban centres of population from one end of Canada to the other. It is an instant indication of the progressive spirit when any city is able to tell the visitor and the outside world that it has a publicity commissioner, an industrial agent or a press service bureau.

This is an entirely new department which has grown up within the past few years in the administration of municipal affairs. Where formerly, we were wont to get along with our finance, public works, fire, water and light committees, we must now have an industrial branch, or a joint committee of the City Council or Board of Trade. The publicity committee is likewise coming to be no small spending department.

Demand and Supply.

In this sphere of municipal government we see the rise of a new profession—a profession that pays salaries commensurate with the importance of the work performed. The fond father of the olden days who considered law or medicine the only professional outlet for his talented son will think twice before sending his boy into fields already overcrowded, when an inviting avenue

L. T. McDONALD.
Industrial Commissioner, Regina.

looms up before his eyes and he sees the magic sign: "Civic Publicity."

"Civic Publicity."

Brainy, energetic publicity experts experts can find a position any place they desire to hang up their hats. The demand far exceeds the supply. The man who can produce results can almost name his own price.

Origination of Movement.

The publicity movement gained its first impetus in the middle west and then developed with remarkable strides to the extreme limits on both sides of the continent. It is hard to say just where the idea first broke loose.

Fort William was long known as a milling centre; that is, it was known and recognized as such by every place else except by Port Arthur, its nearest neighbor. These two rival cities at the head of the Great Lakes were supremely happy when they were indulging in the pleasant pastime of heaving bricks at each other. One day, Fort William emerged with a triumphant chortle over the engagement of a publicity commissioner at a salary that left Port Arthur in a dazed condition. This new official happened to be one, H. W. Baker, who had seen service in some of the large cities of the United States, but had been attracted to civic publicity work as a promising field for early development.

H. W. BAKER.
Industrial Commissioner, Ottawa.

The advantages of Fort William were soon emblazoned in a manner that resulted in a very perceptible increase in the city's population, and there was an industrial stimulus that benefited everybody.

Ottawa, the beautiful Capital nestling up there among the Laurentian hills that make the Ottawa Valley a region of constant delight to tourists and those fortunate enough to have their residence in that district, decided, three or four years ago that it should join in the publicity procession or be left in the industrial lurch. About a score of active members of the Ottawa Board of Trade met one evening, talked things over and came to the conclusion to launch a publicity campaign that would make the other cities gape with astonishment and display a deep sea green of civic envy.

After a canvas had been made of the merchants and manufacturers, it was found that every one of them stood in favor of convincing Canada and the world at large that Ottawa was more than a National Capital and a peaceful home for civil servants.

The publicity movement spread over the city like wildfire. It was talked from the hustings during the munici-

H. M. MARSH.
Industrial Commissioner, Hamilton.

pal election; in fact it was the most popular subject any candidate could include in the course of his remarks. The upshot was that Ottawa opened an industrial bureau, secured H. W. Baker from Fort William, as commissioner in charge, and has since been spending $15,000 a year, one-third of this sum being raised by Board of Trade subscriptions, and the other two-thirds coming from the civic coffers for a stated period under special legislation.

Montreal, the Metropolis of Canada, was content for a time to pursue the even tenor of her way and maintain her commanding lead in handling the commerce of the Dominion. The conservative element looked askance at any movement with a view to the inauguration of publicity for a city with over

K. S. FENWICK,
Industrial Commissioner, Quebec.

half a million population; but the march of progress was not to be arrested, and so we have in Montreal the Press Service Bureau, which has been organized "for the purpose of setting forth in a systematic manner by articles and advertisements the possibilities of the city with a view to attracting trade, commerce, capital and tourist traffic to Montreal in particular, and the Dominion in general."

Newspaper Men in Request.

The development of the science of civic publicity is working havoc with the ranks of the newspaper men. Calgary is paying a handsome salary, something like $4,000 a year, to Mr. Andrew Miller, formerly managing editor of the Ottawa Free Press, and a journalistic worker in Toronto for several years. Mr. Miller naturally believes in printer's ink, but he also employs what he calls "the gumshoe" method, which consists of quietly slipping away to New York or some other city and arguing out in person that Calgary is the only city on the Canadian map worth while bothering with. Rival publicity commissioners have to admit that Mr. Miller's method is a winner, as they have found out to their own disappointment.

F. Maclure Sclanders, Commissioner of the Board of Trade at Saskatoon, is another newspaper graduate. He has led an adventurous career, having been twice around the world since leaving Glasgow, his native city. He works along original lines and gets results, because Saskatoon is growing and booming in true western style.

Arthur S. Barnstead, the secretary of industries and immigration for Nova Scotia, is a college graduate who took a law course and subsequently became editor-in-chief of the Acadian Recorder, the oldest newspaper in Nova Scotia. This bureau spends $20,000 a year, of which one-quarter goes for salaries.

Take Mr. J. Grant Henderson, who decided to transfer his allegiance from the Ambitious City that boasts of its famous mountain to the Forest City that boasts of the River Thames—excepting when it overflows in the spring of the year. He is another publicity worker who enjoyed a long experience with the newspaper profession. He is a Hamilton man, born and bred there, but London made him such a generous proposal that he could not resist, and when the change was announced there was criticism over a stingy policy that let such a well qualified man get away to a rival city. He recently resigned the London appointment.

It is only three years ago that Hamilton Council made the appointment of an industrial commissioner who would devote his entire time to this office, and in the intervening period over twenty large industries have located in that city.

London business men took a spurt recently in the publicity line, and besides engaging the services of Mr. Henderson, raised the sum of $100,000 to be invested in new industries locating in that city that require the assistance of local capital.

The Board of Trade in Brantford has raised $3,000 a year in subscriptions for the next three years as an annual appropriation for an industrial bureau to be established there.

For the past year or two Windsor has shown surprising industrial development, credited to the work of Charles L. Barker, Publicity Commissioner, and the joint industrial committee of the Board of Trade and City Council.

Winnipeg a Pioneer.

The city of Winnipeg was one of the pioneers in the publicity movement. A wonderful success has been achieved there, due to perfection of organization and the resourceful methods adopted by Charles F. Roland, the Industrial Commisioner, who is paid $5,000 a year in salary, and has almost unlimited resources at his command for handling the work. The city grant in 1906 was $1,500. It has been increased nearly a scorefold, as the grant was $25,000 in 1911.

Elliot S. Rowe, a native of Whitby, has been called the Ambulating Ad. for Vancouver. He is a teacher, preacher, lecturer, investigator and informant, but principally and mostly he is the official publicity purveyor for the metropolis of British Columbia.

Cities are not the only municipal corporations that have a monopoly of this new science of booming some particular community. The county councils are awakening to the importance of the work. During the past two years Lambton, Norfolk and Essex counties in Ontario have been placed on the honor roll, with the principal object of attracting settlers from Michigan, Ohio, Illinois, and Indiana, and from the Old Country, in addition to promoting the "Stay-in-Ontario" campaign.

CHAS. S. HOTCHKISS,
Industrial Commissioner, Edmonton.

H. M. Marsh, Commissioner of Industries for Hamilton, Ont., was for fifteen years connected with the Hamilton Cotton Co., during which time he managed several departments. He was appointed Commissioner of Industries on May 1, 1912.

Canada's Automobile Market and Manufacturing Prospects

By Chas. L. Barker*

The automobile and motor vehicle are here to stay, and concerning them, there may be said as of the telephone, it seems hard to realize how commerce and industry got along previous to their advent. Canada, as will be noted, appreciates the utility of both types of machine, and little wonder is it that a disposition to manufacture for both home and foreign consumption is largely in evidence.

As an indication of the extensive market existing in Canada for automobiles, it might be cited that the biggest item in the list of imports from the United States for 1912 was that of automobiles, the amount being $8,858,694.

The automobile industry in Canada has scarcely emerged from the infancy stage. Up until a year ago, the trade has been largely supplied by firms in the neighboring Republic. Eighty per cent. of imported automobiles came from the United States, only three per cent. from Britain and less than two per cent. from France and other European countries. The remaining percentage were of Canadian manufacture. It is not anticipated, however, that the imports will continue in these proportions. New automobile industries are being established on the Canadian side, and, naturally these firms will draw the cream of the business in the future. There is preponderating evidence that Canadians, who for the most part prefer "Made-in-Canada" goods, show a decided liking, when it comes to automobiles, for American makes. European cars are rarely found in any of the Provinces of the Dominion.

Statistical Records.

The Trade and Commerce Department at Ottawa reports that there were 3,488 automobiles imported in 1911 and 6,020 in 1912, showing that the trade almost doubled in one year.

The value of autos and motor vehicles imported in 1911 was $4,235,196, while the duty paid on same amounted to $1,443,898. The value of automobile parts imported in 1911 was $522,223, and the duty paid was $179,889.

For 1912 the value of imported automobiles was practically double that of the preceding year, and for this year it is estimated that Canadians paid out about three millions of dollars in duties on imported automobiles, nearly all of which were purchased in the United States. When we say "this year" we refer to the fiscal year ended March 31 last. Canada's ten-year tribute to the god of speed and convenience, through the automobile alone, is officially estimated at $118,000,000. During the past decade, despite the high cost of living, Canadians have paid out this enormous sum for the most modern achievement of the pleasure-loving age and the "get-there" era. The figures are based on the estimated sale in Canada of about 60,000 machines, at an average, say, of $2,000 each. This may be a trifle high, but an expenditure of a hundred millions seems well within the mark.

Canadian Plants.

The rapid development of the trade in Canada and its alluring possibilities have attracted a number of automobile firms from the United States, in order to take advantage of the 35 per cent. duty. In addition, there are a number of what might be called purely Canadian automobile companies, who are doing a splendid business because they know the trade conditions, and also for the reason they turn out high-grade and reliable products.

CHAS. L. BARKER,
Industrial Commissioner, London, Ont.

The Canadian census figures show only eight establishments engaged in the manufacture of automobiles and eleven in automobile repairs and accessories. Since these figures were compiled, several others have started up, mostly American Companies operating under Canadian charters and incorporation papers. For instance, there are now American branch industries in Canada turning out automobile castings, bodies, trimmings, tops, wheels, etc. The Kelsey Wheel Co., of Detroit, is building at Windsor, Ont., the largest automobile wheel plant in the whole British Empire.

The Ford Motor Co.

As an example of the growth of the automobile trade in the Dominion, it is violating no confidence to say that the Ford Motor Co. of Canada, turned out, approximately, 5,000 cars two years ago. Last year the output was about 10,000 machines. So far, this year, there have been 13,000 cars shipped, and there are orders, at this writing, for 3,000 more. The Ford Co. is the largest automobile firm in Canada, employing from 1,200 to 1,500 hands, and turning out as many as forty machines a day.

The development of the Ford business furnishes probably the greatest record made by any industrial firm in Canada. At the time the Canadian company was organized, about 1905, the stock went begging, and Mr. Gordon McGregor, the present managing director, almost despaired of raising the required capital. He finally succeeded, however, and organized a company with $125,000 capital. The first dividend was 6 per cent. Then for two years no dividends were declared. The business, after that began to show signs of prosperity, and a ten per cent. dividend was followed by hundred per cent. cash return for the stockholders in 1910. The same dividend was paid for 1911. In 1912 the capital was increased to a million dollars under a Dominion charter, there being a distribution of six shares of new stock for one of the old, and later a bonus of two more shares, making eight to one share in the old company. The cash dividend was at the rate of 120 per cent. for the year.

By reason of their location, opposite the city of Detroit, which is the automobile centre for the United States, Windsor, Walkerville and Ford City have become the manufacturing centre for the automobile trade in Canada. The E. M. F. Co., now known as the Studebaker Corporation, with an estimated output of 5,000 cars per year, the Hupmobile Co., the Gramm Motor Truck Co., the Canadian Commercial Motor Co., the Tate Electrics, Ltd., Fisher Body Co., Dominion Stamping Co., Kelsey Wheel Co., American Auto Top Co., American Auto Trimming Co. and R. C. H. or Hupp-Yeats are some of the more important industries in the Windsor, Walkerville and Ford City district.

When we mention the Russell Motor Car Co., Tudhope, McLaughlin, Keeton, Brockville, etc., the reader will understand that the industry extends to other important towns and cities in Ontario.

That there is an expanding market in

*Industrial Commissioner, Windsor, Ont.

Canada, no one will attempt to deny, for the medium and higher-priced cars, and also for the manufacture of autos for export. Nearly all of the automobile firms in Canada are doing a large business in export trade, by reason of favorable tariff arrangements with foreign countries, but more especially those in the British Empire, which can hardly be called "foreign," in the accepted sense of the term, to Canadians and Canadian manufacturers. Without making any particular effort to cater to the Canadian trade, the makers of the higher-priced cars in the United States have enjoyed a fine record of sales to Canadian buyers. Unofficial returns, but from a reliable source, are that the Cadillacs sold in Canada last year numbered about 500. There were possibly 350 Overlands, 200 Packards, 200 Chalmers and 100 Loziers. It seems safe to say that the year 1913 will see an output of 30,000 cars in Canada, and the total may run even beyond that. Over 20,000 of these cars will be of purely Canadian manufacture.

What of the future? With the tremendous immigration that is flowing into the country and its unexampled prosperity and rapid development, it is easy to believe that the output for next year will be 40,000 cars—perhaps 50,000.

"Canada is practically a virgin field for the automobile industry," declared a well-known authority, who follows the auto shows in various cities throughout Canada and the United States and knows conditions perfectly. "There is absolutely no sign yet of over-production, and no danger of that so long as Canada goes ahead the way it has done the past few years."

Observations Relative to Getting New Industries

The data forming the subject matter of this article is equally applicable to any municipality, and because of its sound reasoning and clear-cutness, should be laid to heart by the citizens and administrators of every Canadian town and city, in order that they approach the industrial question from a proper standpoint.

ON the occasion of his appointment as Commissioner of Commerce and Manufacture for the town of Lethbridge, Alta., Joseph P. Tracy was tendered a complimentary banquet by the citizens, at which he delivered an address. His observations on the subject of getting new industries to a city are interesting. He said in part:—

Expansion in Manufacture.

During the last ten years especially, there has been a general seeking after factories. All progressive cities have awakened to the importance of this policy, and much knowledge gained by experience is available on the subject. I would not venture to say that factory establishment has developed into a science, an art, a profession or a craft; however, several general tendencies in location and growth have been manifested to those studying the subject.

Under my observation, new manufacturing enterprise most often arises out of a community itself. Not many factories worth having will migrate. There are exceptions, of course, but they are rare. Some communities have sought to rob other places of their factories. The consequences following such efforts have generally compared with those results that follow other forms of stealing. An industrial policy should follow legitimate lines. As in other spheres the human element is the most important in manufacturing. Capable management is even more important than cheap materials, adequate capital, or good transportation. The manufacturer is a man. Man has dominion over all the resources and creatures of the earth, and, Godlike, he can make choice of his location, and assemble what he needs and what he pleases.

The first suggestion to manufacture probably comes to the consumer and the distributor. In the ordinary course of life, they observe or perceive the necessity or opportunity for making something.

A genius is found to invent.

An executive is found to superintend.

Materials are found assembled and processed.

Salesmen are employed to sell, and lo, we have a factory.

These conditions may arise in Lethbridge. Indeed, with so many of our needs now supplied from other localities, with so many resources at hand, and with so many liberal inducements offered by the municipality and such a favorable market in sight, I shall expect embryonic factories to bud on every hand—from the students, from the merchants, from the craftsmen, and indeed from anywhere.

A Natural Policy.

There is a diversity of gifts in our human nature that is interesting in this connection. For example, with a piece of metal in hand, one may produce a watch, another a stove, another a gun, another a rail, another a ship, another a sword, another a plowshare, another a spear, another a pruning hook.

With a bit of silica sand, one may produce a window, another a bottle, another a vase, another a marble, another a sidewalk, another a stone.

My thought then is to arouse those who have gifts to an appreciation of the opportunities for the exercise of their gifts in Lethbridge, and the first natural expectation is that those who have already undertaken the manufacture of anything in Lethbridge will expand and enlarge their enterprises as far as they can safely and profitably do so. To these we offer hearty support.

The next natural expectation is that those who live in this locality and incline to manufacture anything or who have capital to invest will first undertake their enterprise in Lethbridge. To these we offer sincere assistance.

The next natural expectation is that those of other localities who may consider the establishment of manufacturing elsewhere will be attracted by a capable and systematic presentation of manufacture to be found in Lethbridge. the advantages and inducements for These will be searched for, and earnestly and honestly dealt with.

Now, these three expectations may all be lively at the same time. I simply put them in the natural order, and from my sense of the situation, I believe a generous whole-hearted co-operation along the lines suggested will result in making Lethbridge a city of renown.

In conclusion I will express my policy and my desires in three short words—ALL JOIN HANDS.

HIRING A STREET SYSTEM TO CELEBRATE.

THE entire street car system of Calgary was hired by the Hudson Bay Co. on the afternoon of Monday, August 18, the day on which their mammoth new Calgary store was formally opened by the Hon. G. H. Bulyea, Lieutenant-Governor of Alberta.

Arrangements were made whereby the sixty-five cars of the Municipal Street Railway System were owned by the Hudson Bay Co. for four hours on that day, and the entire population of Calgary were invited to ride free between the hours of 2 and 6 o'clock in the afternoon. Every citizen who took the street car to and from the opening ceremonies was thus the guest of the great company.

It is not known what the Hudson Bay Co. agreed to pay the City of Calgary for the privilege of owning sixty-five street cars for half a day, but it must be a large sum, as the Calgary Municipal Railway does an enormous business and pays very high returns.

Cheaper Fuel, Saskatchewan's Industrial Problem

The results of the investigations carried out with a view to determining the value of lignite as a fuel for power generation and general industrial purposes, are highly encouraging, and give indication that the handicap under which the Province now labors with regard to the establishment of factories, is a near future removal possibility.

THE extraordinary growth of the Province of Saskatchewan calls for cheaper power and cheaper fuel, and this matter has been under consideration, both publicly and privately, for a very long time. The government having decided to make an appropriation of $3,000 in order to obtain a report on the subject of producing power at the mines and distributing it throughout the Province, the matter was given to A. J. McPherson, chairman of the Board of Highway Commissioners, who secured R. O. Wynne-Roberts to undertake the work. The latter gentdleman immmediately started to collect data as to what fuel was available, and in what manner it was being consumed. He entered into correspondence with authorities in all parts of the world, so as to obtain the best information on the subject, and his report has now been handed in.

Cheaper Fuel a Necessity.

It will be apparent to the reader that the real development of Saskatchewan will in a large measure be dependent on the supply of cheaper fuel and power than is now available. At present about half a million tons of imported coal is being brought into the Province from Western Canada and the United States, and about 200,000 tons are being mined in the neighborhood of Estevan. About half of this goes to Manitoba towns; consequently the consumption of coal in the Province amounts to about 600,000 tons, of which only 17 per cent. is of local production. Imported American coal costs anything from $8 to $13 per ton, and when it is borne in mind that the prosperity of the Eastern States of America is due to the low cost of fuel (for instance, it only costs $1 per ton in Pittsburg), it is clear that industries are not possible without causing the production to be too high in price to compete with the imported article.

What is Lignite.

What is lignite? To understand what lignite is we must start with peat, which is the result of the decomposition of vegetable tissue in water when free from contact with air. Vegetation which is now found in swamps each year dies and fresh growth develops. In course of time the accumulation of vegetable matter assumes considerable thickness. Peat ranges in character from brown fibrous and friable matter to almost black carbonaceous matter. The next step in coal formation forms lignite which under pressure of superincumbent earth deposited through subsequent geological ages has been compressed, preserving in many cases its vegetable structure. In other cases, however, it is devoid of all signs of vegetation, when it is difficult to define the difference between it and bituminous coal. These two fuels belong to what geologists call the recent fossil age. The next kind of coal to be formed is bituminous, and finally we get the oldest coal, which is anthracite.

Question of Fuel Values.

The next question is the value of these fuels for general use. Peat is used in many countries as domestic fuel and for the development of power, but as it usually contains from 80 to 90 per cent. of water, it has to be air dried before it can be used with any degree of efficiency. Lignite also is used in some countries to a very great extent; for instance Germany consumes eighty million tons per annum, and some of the German and Austrian cities use more lignite than any other kind of fuel. Up to the present the quantity of lignite used in North America is comparatively small, which is due to the fact that there is abundance of cheap bituminous coal, but of late years more attention has been directed towards the use of lignite.

Location of Lignite Fields.

According to the Canadian Geological Survey Reports, there is a large field of lignite extending southwards from Moose Jaw to Estevan in one direction, and westwards to Wood Mountain in the other. The area is of a triangular shape, and is reputed to contain 15,000 million tons. This figure, however, is undoubtedly conservative, as wells have been sunk near Estevan in which several layers of lignite have been found to a depth of 600 feet. There is another lignite field in Saskatchewan, which lies along the Alberta boundary commmencing with a line drawn from Maple Creek towards Saskatoon, and back to the Alberta boundary north of Macklin. This also contains a very large amount of lignite, but has unfortunately not been prospected to the same extent as the southern field.

Lignite for Power Generation.

Lignite is being used to generate power at the flour mills in Saskatchewan and Manitoba, on occasions at the electrical plants in Regina and Moose Jaw, and in connection with gas producers at Rouleau and Swift Current. Owing to the absence of reliable information as to the results obtained in consuming lignite for power generation, Mr. Wynne-Roberts and the conthority of Mr. McPherson and the consent of Mr. Carpenter, Deputy Minister of Public Works, asked Mr. R. N. Blackburn, Wh. Sch., chief inspector of steam boilers, to undertake scientific and practical tests. These tests were made at Estevan and Weyburn. Full particulars are given in the report, but it may here be pointed out that the net heating power obtained in steam power was only about 50 per cent. of that contained in the coal. In ordinary practice 70 per cent. is recognized to be good, and Mr. Wynne-Roberts in his report points out that if 70 per cent. of heat value is worth, say, $100, fifty per cent. efficiency is only worth $70, so that there is a loss of $30 in every hundred. Information has been received showing that 70 per cent. efficiency has been secured with lignite in some German plants. It is therefore evident that it is worth an effort and some expenditure to secure better efficiency.

Lignite for Gas Producers.

The Canadian Government carried out some tests at the McGill University in 1908, both with steam power and gas producers. The United States Bureau of Mines also carried out a large number of tests at St. Louis and at Pittsburg. There are a large number of ber of tests at St. Louis and at Pittsburg. There are a large number of plants in actual operation in Texas, which by the way is the largest consumer of lignite in North America. The average results of all these tests demonstrate that it is quite possible to develope one brake horse power by means of gas producers and engines for the consumption of about three pounds of lignite, but to obtain the same power by steam it is necessary to consume about three times as much. It is therefore apparent that lignite is better adapted for use in gas producers than in steam boilers.

Lignite for Gas Manufacture.

Another use made of lignite is in the manufacture of gas in large quantity. Many experiments have shown the possibility of making gas from lignite suitable for general use. This is done by means of the ordinary gas works plant, but the coke residue from the coal cannot without treatment be utilized. It can, however, be made into briquettes.

and excellent fuel is by this means to be obtained. Experiments have also been made in this direction in Texas; Ann Arbor, Mich.; at St. Louis, Mo.; at Speccia, Italy, and at Teplitz, Austria, which are confirmed by the results obtained in North Dakota.

Cheaper Power From Lignite.

There is no doubt that by adopting suitable appliances for consuming lignite it can be used for the development of power. Lignite being so different from coal in that it contains so much volatile matter and water and much less carbon it must evidently be used in a different manner. The Germans have evolved special furnaces for this fuel to raise steam, and they have adapted a number of gas producers for gasifying the lignite. This aspect of the use of lignite is set forth in the report in a chapter of great length. Mr. Wynne-Roberts has submitted several schemes for the generation of power at large central power stations located at the lignite mines, with copious figures showing the estimated cost of installing and working the same. These estimates are based on the first instalment of 10,000 h.p. It is, of course, impossible to review these figures here, but the general results indicate that it is quite possible to develop and transmit power to a large number of our towns at a rate much below what now obtains.

In these investigations Mr. Wynne-Roberts was assited by Mr. C. C. Cronk, and by Mr. L. W. Wynne-Roberts, B. Sc. Eng., London.

MUNICIPAL BREVITIES.

Guelph, Ont., claims to be the first Canadian Municipality to operate all its public utilities successfully.

Thorold, Ont., has secured $3,000,000 worth of new industries in the last eight months.

Ottawa, Ont., has 192 important industries of various kinds, giving employment to 18,500 persons, with an annual pay roll of $8,500,000.

Lethbridge, Alta., has a population of nearly 20,000, and is the third city in Alberta.

Three Rivers, Que.—The Canada Iron Corporation recently spent $300,000 in enlarging their plant here.

Edmonton, Alta., in 1901 had a population of 3,167; it has now 53,611.

Winnipeg, Man., has 368 factories operating, employing 20,000 hands, with a capital of $43,000,000 invested.

Weyburn, Sask., 10 years ago, was not on the map; its population is now estimated at 5,345.

Welland, Ont., has every trunk line in Canada, seven in all, passing through the corporation limits.

Yorkton, Sask., has a machine shop, a flour and oat-meal mill, a sash and door factory, two brick yards, and a cement works.

Woodstock, Ont., is on the Hydro-Electric Power Commission line,.

Prince Albert, Sask., is developing hydro-electric power from La Colle Falls, twenty miles away.

Sherbrooke, Que., industries include iron, scales, boilers, jewelry, woollen goods, tobacco, medicine.

North Battleford, Sask., population has jumped from 1,877 in 1910 to 6,000 in 1913.

Hamilton, Ont., in the last ten years has secured twenty million dollars in plant values from American manufacturers.

Wilkie, Sask., Board of Trade is negotiating with the C. P. R. for the purchase of land to be used for industrial sites.

Fredericton, N.B. sells industrial sites at $1,000 an acre, but will give them away when occasion demands.

Three Rivers, Que.—An electric railway has been projected to connect all towns in the vicinity of Three Rivers, Que.

The Selkirk Development Co., Ltd., is a quasi-municipal enterprise organized for the purpose of assisting new industries with locations in Selkirk, Man.

Melfort, Sask., is installing sewerage, water and electric light plants, to be finished in September.

Owen Sound requires industries to employ female help, of which it has an abundance.

Nanaimo, B. C., has the largest coal mines in British Columbia.

Windsor Ont., is the centre of the automobile business for Canada, occupying the same position here as Detroit does in the United States.

One of Hamilton's claims for success is that the consuming population lies within what it calls "short delivery distances."

Port Arthur claims to have 3,000,000,000 tons of iron ore within a radius of 150 miles.

Hamilton, Ont. gets its electricity from large power companies generating at Decew and Niagara Falls, 35 and 42 miles distant respectively.

Weyburn, Sask. gives electric power to industrial concerns operating regularly at least five hours per night at power rates.

Calgary, Alta., supplies power to all industries at absolute cost, which ranges from one cent per kilowatt hour down to three-quarters of a cent, according to the amount used.

Prince Albert, Sask.—When the dam at La Colle Falls is completed, Prince Albert will be able to supply 13,000 h.p. for industrial purposes at a cost not exceeding $25 per h.p. per annum.

Woodstock, Ont. sells hydro-electric power for motors aggregating over 100 h.p. at $32.40 per h.p. per annum.

Welland, Ont.—Electrical energy to the amount of half a million horsepower is developed within twelve miles of Welland, by four competing companies.

Windsor, Ont., will shortly have power from the Ontario Hydro-Electric Commission. At present it is supplied by a private company.

Yorkton, Sask. owns its electric light and power plant, and makes special rates for manufacturers.

Brantford, Ont., has an unlimited supply of natural gas which is supplied to factories at 35 cents.

Port Colborne, Ont. can supply electric power at $16 per year, or at a regular meter rate of one and a quarter cents per k.w.

London, Ont. supplies hydro-electric power at $24, but a $4 reduction is promised.

Owen Sound, Ont., owns an electric light plant and a gas plant.

Trenton, Ont. has two dams within its corporate bounds, one of which is harnessed, generating 5,000 h.p. The other will shortly be developing 6,000 h.p. A 24 hour service can be supplied to manufacturers as low as $12.

Selkirk, Man. gets its power from The Winnipeg Electric Railway Co., and claims to have the lowest rates in Western Canada.

Three Rivers, Que.—The Shawinigan Water and Power Co. and the North Shore Power Co. are both within easy distance of Three Rivers, to which they supply power.

Fredericton, N.B.—The rates for electric power in Fredericton, vary from 2.7 cents to 9 cents per k.w., and the average charge at present is 5 cents.

The Trade and Industries of British Columbia Cities*

By Consul General D. F. Wilber

There is contained in this article an exhaustive statement of the present industrial achievements of Canada's Pacific Coast Province, together with observations covering the immediate and near future outlook, due to developments arising from the opening of the Panama Canal and the increasing prosperity of the Dominion generally.

VANCOUVER.

THE City of Vancouver is situated on Burrard Inlet and was incorporated in 1886. It has an area of 16.89 square miles and a present estimated population of 125,000. It has exceptionally good shipping facilities, is connected with foreign ports by a number of large steamship lines, and has a large tonnage in local shipping. Until 10 years ago the Canadian Pacific Railway Steamship Co. was the only line that carried on trade between Vancouver and the Orient. A number of other lines now share this trade.

Eight large steamship lines are making this place a principal port of call, not taking into account the many tramp steamers, sailing vessels and the local shipping. With the opening of the Panama Canal, a number of others will be added to this number, as well as increased facilities for handling the trade by the present lines.

Harbor Improvements.

While as yet nothing definite has been accomplished in the way of harbor improvements for Vancouver that can properly be credited to preparation for the canal business, a number of projects are under way that will materially assist in the handling of it. The dredging of the channel of False Creek will allow additional room for local shipping, and thus assist the probable congestion on the main water front. The improvement and completion of the several transcontinental railway lines will add to the transportation facilities for the removal of freight. The proposed Government wharf, which, if constructed, will be of re-inforced concrete, will extend into Burrard Inlet between 850 and 1,000 feet, with at least three sheds for freight and passenger accommodation of the latest type, costing $1,500,000, with four tracks running to the end of the dock, one of which will run along the edge in order that cargo can be unloaded from the vessels direct into the cars.

VICTORIA, B.C., INNER HARBOR, SHOWING DOCKS OF CANADIAN PACIFIC RAILWAY AND G.T.P. RAILWAY.

Steamship Lines.

The following lines are at present running into Vancouver; Canadian Pacific Railway Steamship Co., in the Oriental trade; the Canadian-Australian Line, operating between Vancouver and Australian ports; the Blue Funnel Line and the Royal Mail Steam Packet Co., running from European ports via India and the Orient; Harrison Line direct and the East Asiatic Co., from European ports via the Straits of Magellan; the Maple Leaf Line, running between eastern United States ports and Vancouver; and the proposed entrance of the Hamburg-American Line on the opening of the Canal. In addition to the above, there are a number of lines running in the local trade, such as the Canadian Pacific Railway Steamship Co., between Vancouver, Northern British Columbia and Alaska; the Grand Trunk Pacific Steamship Co. and the Union Steamship Co., running between Vancouver and Northern British Columbia ports; Pacific Coast Steamship Co., running between Vancouver and San Francisco; and a large shipping in local boats, tugs, tramp steamers, and sailing vessels, carrying lumber and ore from British Columbia and bringing various products to its ports. Among these are the oil steamers from California, and the sugar steamers from the Orient, South America, and the West Indies.

1912 Tonnage.

The following table shows the inward and outward tonnage from this port during 1912:

	Inward.		Outward.	
	Vessels	Tonnage	Vessels	Tonnage
Deep water ..	2,420	2,031,943	2,305	2,025,715
Coasting trade	8,237	3,205,067	8,623	3,449,620
Total	10,657	5,237,010	10,928	5,475,335

American Trade With Vancouver.

There is probably no city of the size of Vancouver where there are the opportunities for the advancement of American trade, owing to its recent establishment and the rapid growth of the city and Province. There is a large sale for building material and also an excellent field for American manufactures. While the British manufacturer has an advantage by reason of the preferential tariff, the American manufacturer has an equal advantage in a great number of cases on account of being closer to the market and the natural demand for a class of goods that a large percentage of the population is accustomed to, and with which the remaining portion of the population is gradually becoming familiar.

Real Estate.

Vancouver's real estate is valued at $138,557,595. and the number of building permits taken out during 1912 was 3,199, valued at $19,388,422, an increase of nearly $1,500,000 over 1911. The following table shows the different classes of buildings covered by these permits:

*Recent Consular report issued by the Bureau of Foreign and Domestic Commerce, Washington, D.C.

Buildings.	No. of Permits.	Value of Property.
Offices and stores.........	305	$7,341,554
Factories and warehouses..	216	1,746,582
Dwelling houses	2,222	3,929,993
Apart. and room. houses..	215	5,830,805
Repairs and miscellaneous	241	539,488
Total	3,199	$19,388,422

Assessment Statement.

The following table shows the steady increase of assessment in the city during the past ten years:

Year.	Real property.	Improvements.	Total assessable property.
1903	$ 13,845,565	$ 9,091,270	$ 22,936,835
1905	16,739,640	11,804,250	28,543,890
1907	38,346,335	16,381,475	54,727,810
1909	48,281,330	24,445,210	72,686,540
1910	76,927,720	29,644,755	106,572,475
1911	98,720,345	37,858,260	136,578,605
1912	138,437,610	54,064,165	192,501,775
1913	144,753,220	68,223,205	212,976,425

Indications are that the building permits will not be as numerous in 1913 as during 1912. The money market is very tight, and there is difficulty in securing loans from the banks except on exceptionally good security other than real property.

Business during 1912 was on the whole very satisfactory, but owing to the tightness of the money market and real estate speculation, the prospects for the coming year are not so good for business in general lines. A great many people who have purchased real estate on long-time agreements are finding it difficult to meet their payments as they come due, and it is expected that real estate values will be materially reduced during the next two years. While a number of large building operations are under way or financed which are necessary to carry out, it is thought that there will be a lull in construction work until conditions are more settled.

Revenue and Expenditure.

The revenue of the City of Vancouver for the year 1912 amounted to $4,008,762 as against $3,013,930 in 1911. The expenditure of the city for 1912 amounted to $11,440,390. The excess of expenditure over revenue is accounted for by the numerous undertakings inaugurated by the city during the year in order to keep pace with the rapid development. This is an increase over the expenditure of 1911 of $3,519,175.

The city's borrowing-power limit for 1913 is $32,908,078, an increase over the borrowing power of 1912 of about $12,000,000. The city's debt amounted to $21,314,363. Adding to this the amount of the proposed by-law covering the estimates for 1913, which amounts to $5,112,800, making a total of $26,201,565, leaves a net borrowing limit for 1913 of $543,484,354 in 1911.

Banking—Sewerage.

There are 60 banks, including branches, situated in Vancouver, and the combined clearings during 1912 amounted to $650,118,887, as against 543,484,354 in 1911.

There is at present a proposed joint sewerage system contemplated covering Vancouver and the different municipalities in the neighborhood of Burrard Inlet, such as South Vancouver, Point Grey, Barnaby, etc. The plant contemplates the construction of a trunk sewer throughout what is known as Greater Vancouver, covering a period of about 40 years. At present borings are being made in order to ascertain the proper locations, kind of materials, and approximate cost.

This sewerage system, which includes New Westminster, covers an area of 55,600 acres. The average rainfall during the past seven years was 56 inches and the average number of wet days 174. The estimated population of the area is 182,000. At present about 6,000 acres are more or less efficiently sewered, although there is no standard basis for design of construction. The estimated cost of construction is $5,500,000 for the first five years, and a similar amount for the following 25 years. The cost of construction will be divided among the different municipalities.

Industries of Vancouver.

Vancouver has 167 manufacturing concerns, employing 9,000 persons, with an annual pay roll of $5,669,000, a total output of $15,727,000, and a total investment of $23,000,000, not including real estate in a number of cases.

The allied timber industry—lumber, shingles, planing mills, sash and door factories, etc.—is the largest single line of manufacturing in Vancouver. These employ more than 4,000 men, with a pay roll of $2,375,000, represent an investment of $9,000,000, amounting to nearly one-half of the industrial business of the city, and have an output of $6,000,000.

There are nine furniture factories in the city, employing about 375 men, with a pay roll of $247,000, with an annual production of $910,000, representing an investment of $500,000.

Next to the timber industry comes the machinery and sheet-metal works of the city. They number some 15 establishments and employ in the neighborhood of 1,000 men with a pay roll of $690,000, an output of $1,800,000, and an investment of some $2,000,000.

The building and repair of small boats is an industry of importance and one that will show a rapid increase as the shipping of the port develops with the opening of the Panama Canal. At present there are seven of these establishments, employing 300 men with a pay roll of $400,000 and an output of about $1,000,000.

The manufacture of bread, cake, and confectionery is of considerable importance. Some 300 persons are employed with a pay roll of $150,000. The annual output is estimated to be $750,000 and about $1,000,000 is invested in the industry.

Printing and bookbinding manufacturers employ 490 persons with a pay roll of about $500,000, an annual production of $2,000,000, and an investment of $1,700,000.

There is one large sugar-refining establishment in the city, which furnishes practically the entire Province with its supply of sugar. Its raw product is brought from different points, such as Java, West Indies, South America, Japan, etc.

There are numerous other classes of manufacturers, such as footwear, clothing, brooms, bricks, cigars, paper and wooden boxes, wire fencing, gas mantles, stained glass, terra-cotta and wooden pipe, canned fruit, etc.

SOUTH VANCOUVER.

SOUTH VANCOUVER is the largest municipality in the vicinity of Vancouver, and is the third largest in the Province according to population, being exceeded by Vancouver and Victoria. It adjoins Vancouver on the south, and is, in fact, in all but its government a part of Vancouver. It has an area of 9,200 acres and an estimated population of 35,000. The population is scattered over the entire municipality, being heaviest along the lines of the street railways that connect it with Vancouver. It is entirely a residential city, and enables the working classes of Vancouver to secure more moderate rentals and home sites. It is only a question of a short time when this municipality, with a number of others in the vicinity, will be added to Vancouver, making a city with a population of 175,000. Its assessable property is valued at about $40,000,000 and its building permits for 1912 amounted to 2,626, valued at $2,635,451.

NORTH VANCOUVER.

NORTH VANCOUVER is situated across Burrard Inlet from Vancouver, a distance of 2½ miles, and is connected by ferry having a 20-minute service. It has a population of 9,000. On the completion of a proposed bridge across what is known as the Second Narrows, which will connect it with Vancouver, its importance will be greatly increased. The ferry, which is owned by the municipality, carried a total 3,304,599 passengers during 1912. The building permits for 1912 amounted to 432, valued at $541,000, and for the entire district about $1,000,000. It is expected that the Pacific & Great Eastern Railway will enter Vancouver by way of North Vancouver, which will have a considerable bearing on the future development of the city and district.

WEST VANCOUVER.

WEST VANCOUVER is one of the newer municipalities, and is situated across Burrard Inlet immediately west of North Vancouver, and was originally a part of that district. Its scenic possibilities as a residential city are at present its principal asset, although its harbor facilities are of great value as well, but on account of being situated so close to Vancouver and North Vancouver, and on account of its size, by reason of its recent incorporation, it will in all probability fail to secure the shipping of the port. At present the city is expending the sum of $250,000 for the construction of an 80-foot marine drive along its entire water front. Its assessment value of the property for 1912 amounted to $4,211,000, as against $1,864,000 in 1911. Its present handicap is the lack of proper transportation facilities with Vancouver. The ferry connecting it with Vancouver carried 90,000 passengers during the last six months of 1912.

POINT GREY.

POINT GREY adjoins Vancouver on its southeastern boundary. It has a population of between 6,000 and 7,000, and an area of 12,000 acres. At the time of its incorporation in 1908, its population was only 150. It is entirely a residential city, and has had a very rapid growth on account of its advantages as a residential place for Vancouver business men. An important factor in connection with its future development is the establishment of the British Columbia University, which will entail a large expenditure of money for buildings and land.

NEW WESTMINSTER.

NEW WESTMINSTER is Vancouver's second largest neighboring city, and has a population of some 20,000. It is located about 15 miles from Vancouver on the Fraser River. The river at this point has a depth of water rarely less than 30 or 40 feet at the wharves, and ocean vessels of 24 feet draft are loaded at this port. Heretofore the sands at the mouth of the river have interfered with navigation. The Dominion Government has already expended some $200,000 in clearing this channel, and will spend in the near future about $800,000 on the same project. Three hundred thousand dollars have also been expended in the purchase of an improved dredge for keeping the channel clear as well as deepening it. It is an excellent harbor, and owing to the fresh water is free from teredos.

There are 11 banks and 65 industrial plants. Its building permits for 1912 amounted to $1,634,528 as against $1,124,587 in 1911. Its total assets are $6,344,008, a surplus over liabilities of $949,302. The Great Northern Railway, Canadian Northern Railway, and Canadian Pacific Railway run through the city and the British Columbia Electric Railway connects it with Vancouver; running two lines in order to handle the traffic. A large harbor project is at present under way, some $500,000 having already been expended on the work.

The annual industrial output of the city amounts to $7,267,520, the pay roll totaling $2,145,840, and the number of employees 2,175, of which about four-fifths are white. These figures do not include the Fraser lumber mills, situated just outside of the limits of the city. The annual output of these mills is 150,000,000 feet, valued at $2,500,000; 1,100 men are employed. The fishing trade is of importance, as some $50,000 worth of halibut is shipped from the Columbia cold storage plant annually, and from 50,000 to 300,000 cases of salmon are canned at the mouth of the Fraser River. The importance of New Westminster is increased by the trade from the numerous smaller towns and municipalities that surround it at distances varying from 5 to 20 miles.

BURNABY.

BURNABY is situated on the Fraser River adjacent to Vancouver, about half-way between that place and New Westminster. It has an area of about 38 square miles, and is at present principally a residential place similar to Point Grey. The building permits and assessments for 1912 amounted to $1,312,850 and $20,576,205, respectively. It has a deep-water sea frontage of 6 miles and a deep-water river frontage of 4¼ miles.

PORT MOODY.

PORT MOODY is at the head of Burrard Inlet, some 12 miles east of Vancouver, at the statutory western terminus of the Canadian Pacific Railway system, and has an estimated population of 1,500 people. It expects to benefit materially from the growth of Vancouver, particularly from the fact that the growth is of a necessity in an easterly direction.

NEWPORT.

NEWPORT, situated on Howe Sound, about 100 miles from Vancouver, on the line of the Pacific and Great Eastern Railway, in a section rich in mineral, agricultural, and timber resources, was at one time the terminus of the local road, the Howe Sound and Northern Railway, recently taken over by the Pacific and Great Eastern Railway. There is at present a question as to whether this road will use Newport or North Vancouver as its terminus, but in all probability, on account of its nearness to Vancouver, North Vancouver will be selected. Newport has an excellent harbor, and will in time be a salt water terminal of some importance, whether or not the railroad uses it for that purpose. Lumber mills are in operation there, and what is considered a valuable clay deposit has recently been discovered and will be an important addition to the manufacturing possibilities of the place. It has considerable undeveloped water power near by that could be utilized for manufacturing purposes.

BELLA COOLA.

BELLA COOLA, situated about 350 miles north of Vancouver and 200 miles south of Prince Rupert, on the head of Burke Channel, is practically the first good harbor north of Vancouver. It is the starting point of the Pacific and Hudson Bay Railway, which will open up that section of British Columbia between the Pacific Great Eastern Railway and the Grand Trunk Pacific Railway. While it is little more than a settlement at the present time its possibilities are very great. There are vast mineral, timber, and agricultural resources lying back of the coast in its vicinity. It has been estimated in recent provincial reports that the port of Bella Coola has a larger acreage subsidiary to it than other British Columbia port.

PRINCE RUPERT.

THE first work of establishing what is at present the city of Prince Rupert was undertaken by the Grand Trunk Pacific Railway during the summer of 1906, prior to which time there was no settlement of any kind, not even an Indian village. The city is situated at the mouth of the Skeena River, opposite Dixon Entrance, within 30 miles of the southern boundary of Alaska and about 540 miles north of Vancouver, and now has a population of 5,000. As the Western terminal of the Grand Trunk Pacific Railway and with a land-locked harbor some 8 miles in width it will, no doubt, become a port of great importance in the future. At least 20 per cent. of the inhabitants are American and their property interests in the city and surrounding country are large.

The total assessed valuation of the

town site plotted is $19,500,000, and there remain large quantities of land to be sold by the railway company and the Provincial Government. Although the Grand Trunk Pacific Railway will not be completed for another year, the port last year had a tonnage arrival of 273,044, comprising 279 vessels. Of these, 123, with a tonnage of 101,031, were from the United States. Two American vessels make weekly calls from Seattle, and there are also 2 Grand Trunk Pacific Railway Co., 2 Canadian Pacific Railway Co., and 2 Union Steamship Co. vessels calling there weekly from Vancouver. In addition to this, there are a number of freight vessels carrying supplies for the railroad. The estimated exports from Prince Rupert for 1912 and 1911 were $64,344 and $33,948, respectively, and the imports for the same period were $614,269 and $500,721, respectively.

The fishing industry is being rapidly developed in this vicinity, there being at present one of the largest cold storage plants on the Pacific Coast located there. In addition, other concerns are making preparations for the expected increase of this industry. The return of salmon from the Skeena River district amounted to 222,035 cases in 1910, 254,410 cases in 1911, and 254,258 cases in 1912.

There is at present under construction by the Dominion Government and the Grand Trunk Pacific Railway a floating dry dock that will cost on completion in the neighborhood of $2,000,000, and the Grand Trunk Pacific Railway intends erecting in the near future a $1,000,000 hotel as well at their terminal station.

On the completion of this road, Prince Rupert will benefit greatly by the westward movement of grain for shipment through the Panama Canal and to the Orient, and the eastward movement of the products of the fishing and timber industry. There are also vast deposits of coal, copper, silver-lead, gold, and other minerals, as well as large tracts of agricultural lands in the interior of British Columbia along the line of the railroad. Excellent prospects for oil and salt have also been found either in the vicinity of Prince Rupert or along the line of the road.

HAZELTON.

HAZELTON, originally a trading post, is situated on the line of the Grand Trunk Pacific Railway at the confluence of the Bulkeley and Skeena Rivers, and has a population of 800 or 900 at present, brought there owing to the construction of the road. The town is situated on the north shore of the river, and, as the railroad is on the south shore, the company has established a place known as South Hazelton. It is expected that upon the completion of the road, the population of Hazelton will move into the new city.

FORT GEORGE.

FORT GEORGE is one of British Columbia's latest northern cities. It is situated on the line of the Grand Trunk Pacific Railway at present under construction, at the junction of the Fraser and Nechaco Rivers, about 450 miles north of Vancouver, 459 miles east of Prince Rupert, and 461 miles west of Edmonton, Alberta. Like Hazelton, it was originally a trading post. The construction of the Grand Trunk Pacific Railway should reach this place from the eastern end by the end of 1913 and should be completed across the continent by 1914.

The proposed construction of the Edmonton, Dunvegan and British Columbia Railway from Edmonton to Fort George, and that of the Pacific and Hudson Bay Railway between Bella Coola, on the Pacific Coast and Fort George, and the completion of the Pacific and Great Eastern Railway between there and Vancouver will make Fort George an important railway centre for the surrounding district.

NELSON DISTRICT.

THE general business situation for the year 1912 in the Nelson district has been in practically a normal state. Generally speaking, all lines of trade and all the various industries have prospered, some perhaps more than others; yet on the whole the situation has been a healthful one and a general feeling throughout the district at the present time is one of prosperity and general advancement in all industries, and undoubtedly each will show a substantial increase over that of the preceding year.

Mineral Production.

Mining has been more active and the results more satisfactory than for some time past. The price of metals, particularly copper, has been such as to allow of mining and treating low-grade properties with a reasonable prospect of profit. In view of the present conditions quite a number of these low-grade properties are being developed, and in some cases large quantities of ore are being shipped. Large mining interests have acquired mines throughout the district either through option or purchase outright and are in many cases installing plants and making necessary preparations for the working of these mines on quite an extensive scale. Possibly 75 per cent. of all mining operations are carried on and financed by American capital, and the opinion seems to be quite universal that without this interest shown by Americans the mining industry would suffer. While a large proportion of the operating mines are yet in the development stage, there are a sufficient number of dividend payers to give encouragement and stimulus to the industry. Districts that appeared promising at the beginning of the year have proven satisfactory, and the indications are that they will develop properties greater than was anticipated.

Aside from the production of copper in the district, which exceeds that of all the other metals combined, the most advancement has been made in zinc properties. Recent discoveries for the treatment of zinc ores have been made by parties in the district, and experiments have advanced to such a state as to warrant the purchase of the Canadian rights by one of the largest smelters in the country. A plant is now being constructed to treat the zinc-bearing ores of the district by the new process.

For 1912 the paying mines have paid practically $1,250,000 in dividends, and this amount will doubtless be exceeded the coming year. The experiments in connection with the treating of platinum, which was discovered in this vicinity last year, are progressing, but at this time are not advanced sufficiently to warrant any extended report on the process or results.

The total mineral production of British Columbia for the past year was approximately $32,606,000, of which this district produced over one-half.

Lumber Industry—Fruit Growing.

The lumber industry on the whole has been a very successful one, although not up to the expectations early in the year. Mills and logging operations were active, and the production was a considerable increase over that of the preceding year. The demand for lumber from the prairie provinces has been good, but the greater portion has been supplied by American lumbermen, particularly in the cheaper grades. The local demand for building material of all kinds has been good, many buildings of various kinds having been erected in the city, and throughout the surrounding country.

The development of fruit orchards is naturally a slow process, and some 8 or 9 years are necessary before results can be expected. In this district there are many orchards now coming into bearing, and within a year or two many more will be producing, which will increase the output enormously. Plans are now being perfected for some practical method of handling and selling the orchard products, and it is expected that some system will be adopted to handle the crop for the coming year. More land is being cleared and prepared ready for planting trees, and while the acreage planted may not be as great as last year, the total will be considerable. There is a demand in the district for plants for the manufacture of jam, canning factories, and cider and vinegar works.

As the yield from orchards increases there will be large quantities of unsaleable fruit that can be worked up into goods of this class, and as at the present time this line of goods is shipped from the East in large quantities, there should be good openings for manufacturing plants of this nature. At the present time there are only two jam factories in the district, one operated by private enterprise and the other by the Doukhobor community. The Doukhobors, it is reported, are to erect a second and larger plant this year.

There are in this district about 4,000 Doukhobors, located in several communities or settlements, all practically under the leadership of one man, who transacts all the business. They have cleared large tracts of land, built sawmills, waterworks, bridges, roads, as well as a great number of houses for their members.

Development of the City.

Local conditions during the past year have been favorable for the development of the city, many large and substantial buildings have been erected in the business district, and also many residences in the residential part of the city. The Canadian Pacific Railway is planning extensive improvements in their yards and shops in this place, and a general improvement in their lines throughout the district. A large steamer is just being completed for their increased traffic, and a general betterment of the system in this district is apparent.

Export Statistics.

A large increase in the value of the exports to the United States over that of any year in the history of this office has taken place, due largely to the general increase in business in all lines and also to the fact that the year's work has been free from interruptions of all kinds. Indications for the coming year are favorable, and it is quite likely that another high mark will be set in most lines of business. As the principal exports of this district are mine products, the increased development of this industry was responsible for the increase in the exports. The following table gives the exports to the United States for 1911 and 1912:

Articles.	1911.	1912.
Blister copper	$3,960,277	$ 7,018,966
Copper matte	319,944	2,636,791
Coal	3,484	3,746
Cyanide	282	......
Cedar poles	8,819	7,038
Electrical supplies	710	......
Furs and hides	5,512	20,649
Fence posts	805	......
Gold concentrates	499,798	620,038
Gold bullion	173,486	134,738
Horses	2,247	835
Household goods	19,718	12,048
Logs	2,982	......
Lumber	5,826	2,992
Machinery	2,164	......
Miscellaneous	120	109
Railroad ties	4,563	3,270
Shingle bolts	540	......
Silver bullion	44,596	427,987
Zinc concentrates	143,852	237,434
Total exports	$5,199,675	$11,156,644
Returned Amer. goods	69,717	30,125
Total	$5,269,392	$11,186,769

WHITE HORSE DISTRICT.

COPPER was the principal mineral mined in the White Horse district, and the ore was all shipped to the smelters at Tacoma, Wash. The shipments in 1912 amounted to 31,404 tons, valued at $229,840. The total value of all exports from this district to the United States was $234,170.

The reported discovery of a rich placer field 50 miles east of Lake Teslin has created considerable interest here and at outside points. Placer mining is being carried on in the Kluane and Livingstone districts on about the same scale as in previous years. Operators in the Kluane district are hopeful that a railroad will be constructed from Haines, Alaska, to the head of the Tanana River. Such a road would tap the longest and most continuously mineralized belt on the American Continent.

VICTORIA.

By Consul A. E. Smith.

THE growth of Victoria in the past five years has been remarkable, the population increasing in that time from 20,000 to 65,000. A great many new buildings have been completed, and many more are in course of completion, including a million-dollar courthouse. In 1912, 1,759 permits were issued involving the expenditure of $8,021,165, as against 1,201 permits involving $4,026,315 in 1911. The fire loss in 1912 was $49,742, as compared with $93,037 in 1911.

The exports to the United States from the Victoria consular district, including the agencies at Nanaimo and Cumberland, were as follows for the calendar years 1911 and 1912:

Articles.	1911.	1912.
Automobiles	$ 5,507	$ 6,712
Coal	1,547,341	3,361,771
Clams	3,192	11,769
Copper matte	683,552	......
Copper	......	16,822
Fertilizer	105,233	229,768
Fish	22,965	7,691
Furs	5,924	11,102
Hides	67,608	90,801
Horses	3,529	9,314
Household goods	24,089	33,407
Junk	11,709	8,301
Logs	130,322	171,636
Liquor	19,347	7,622
Shingles	13,269	11,104
Whale oil	252,917	307,872
Miscellaneous	41,592	24,439
Total	$3,028,099	$2,313,246
Returned Amer. goods	93,539	176,966
Total	$3,121,638	$2,490,212

NANAIMO.

NANAIMO, with a population of 10,000, is the centre of the coal mining industry of the province. This industry is rapidly growing in magnitude. The lumber industry is also of great importance. When dredging operations are completed, the Nanaimo mills will be able to engage in the Australian and foreign trade, which is at present impossible owing to the lack of deep-sea shipping facilities. The manufacture of bricks bids fair to rival the lumber industry in importance. One company has a plant with a capacity of 20,000 bricks a day.

ESQUIMALT.

IMPROVEMENTS are now going on in the harbor of Esquimalt on the breakwater, and two piers of 1,000 feet in length are proposed, which, on completion, will give vessels 4,000 feet of dockage with a depth at low water of 35 feet.

As soon as arrangements can be made, the contract is to be let for building the railroad bridge to Hospital Point from Johnson Street, which will add 25 acres to the Songhees Reserve, besides making it a depth at low water of 35 feet for dockage. The Government appropriated $1,500,000 to advance that work.

It is understood that Parliament will be induced before the close of this session to provide for constructing a new Government-owned dry dock at Esquimalt 1,100 feet in length, modern in every respect, and divided to accommodate two smaller ships at any time. The estimated cost is $1,500,000.

IMPRESSIVE.

THE navy increases of Great Britain were rather impressively set forth in the estimates introduced in the House of Commons on July 17. "We are," it is explained, "due to receive a torpedo-boat destroyer on the average of one a week for the next nine months. During the next 12 months we shall receive on the average a light cruiser every 30 days, and during the next 18 months we shall on the average receive a super-Dreadnought of the latest possible type, and of the highest possible cost every 45 days." Incidentally, it is held that the age of oil firing has come, and that destroyers, cruisers and battleships are all being ordered for oil firing only.

Industries In Request by Many Canadian Towns and Cities

Staff Article

No attempt is made in this brief sketch to include even all of the more important towns or cities of the Dominion, rather, is it, by reference to the varied attractions of a few, to show that successful industrial enterprise has an unlimited scope within our borders.

THERE is not a city, town or village in Canada but is specially fitted for some particular industry, by reason of its raw products, its geographical position, power, or exceptional labor conditions. There are towns in the West, like Souris and Estevan, blessed with a choice supply of clay which makes exceptionally fine brick. Such towns are suited for brick-making industries.

Windsor, Ont., has the largest salt industry in Canada, and consequently is an ideal location for chemical works. By its nearness to Detroit, it becomes the Mecca for automobile industries. The United States Steel Corporation will provide another source of raw material in their big steel plant, which will attract subsidiary trades.

To determine what industries were being sought by various towns in Canada, we sent a circular letter to a number of municipalities, and the replies received are of considerable value because the industrial commissioners and secretaries of Boards of Trade have not exaggerated their claims, and in most instances have stated exactly what trades could find a suitable market in their districts.

Locations and Offerings.

Nanaimo, B. C.—From far-off Nanaimo, on Vancouver Island B.C., the Commissioner, H. G. Coleman, writes: "As Vancouver Island is only just being opened up, it is impossible for me to say what raw material we have. However, those which have been developed, include coal and timber, and prove conclusively that this Island has a bright future. Nanaimo has lumber mills, sash and door factories, box factories, breweries, cigar factories, powder works, etc. Population, 3,000."

Peterborough, Ont. claims a phenomenal increase in population—63 per cent. in ten years. Chief industries are, The Canadian General Electric Co., Quaker Oats Co., Brinton Carpet Co., Delaval Separator Co., Henry Hope & Sons, and the Vermont Marble Co. It is surrounded by an agricultural and dairy district. Population, 22,500.

North Battleford, Sask. is a new city; manufactures cigars, flour, brick, candy, and sashes and doors; is a distributing centre for harvesting machinery; makes complete reports on any industry, and assists new industries; on C. N. R. and G. T. P. Commissioner N. G. Neil. Civic electric light and water plants. Pop., 5,000.

Owen Sound, Ont., wants iron, white wear or knitting industries; plenty of female help; freight rates a dollar less than to inland towns; two railways and 4 steamship lines; civic light, water, gas and power plants. Population, 13,000.

Melfort, Sask., has opening for pork-packing plant, flour-mill, and brick plant; will be on Hudson Bay Railway; has government creamery; took 84 car lots of farm machinery in 1912; and 102 cars of lumber; on C. N. R.; water and electric light. Population. 1,522.

Trenton, Ont., seeks iron industries on account of an iron concentrating plant there. Raw materials—iron, graphite, galina, talc, marble, timber. Two paper mills near. Has 3 railroads, good harbor, and is on Trent canal, 100 miles from Toronto, and 235 from Montreal. Cheap electric power. Population, 5,000.

Selkirk, Man. is near Winnipeg. Will get Manitoba Rolling Mills, Manitoba Nut & Bolt Works, and a horse shoe plant. Connection by water with Lake Winnipeg. Civic light and power plant. The Selkirk Development Co. assists new industries.

Three Rivers, Que., has manufactures of pulp and paper, cotton, boots and shoes, iron, gloves, chairs, silver plating, sash and door, whitewear. There are five railways, daily steamship service to Montreal and Quebec; a splendid harbor, and plenty of cheap power. Population 18,000.

Fredericton, N.B., needs the following industries:—Foundries, steel plants, furniture factory, canning factory, tanneries, etc. Has river service, new wharf; is near Drummond iron mines; raw material from mines and forests also near. Industrial sites, $1,000 an acre; free water; private owned power plant; civic water plant. Population 14,500.

Sault Ste. Marie, Ont.—Abundance of raw material, including iron ore and lumber; land available for industrial sites. Present industries include steel plant of Algoma Steel Corporation. Low water freight rates for eight months of year; headquarters of Algoma Central and Hudson Bay Rly.; undeveloped water power; on the C. P. R. Population, (including Steelton), 18,500.

Prince Albert, Sask. seeks industries that can use natural resources such as clay, sand, building stone, timber, mixed farming products and ochre. Gives free sites, cheap power, and unlimited water. Owing to large lumbering, fishing and fur industries, has an ideal labor market. Population, 13,000.

Sherbrooke, Que.—City has options on sites near the railway. Industries include Canadian Ingersoll-Rand Ltd., E. & T. Fairbanks Co., Ltd., Sherbrooke Machinery Co., Paton Mfg. Co., the Jenckes Machine Co., Ltd. Raw materials—timber, brick, sand, iron and copper deposits, limestone. Eighty per cent. of the world's supply of asbestos is mined near Sherbrooke. Water power in unlimited quanitites is available for new industries from the Magog River. Railways—C.P.R., G.T.R., Q.C.R., and B. & M. Population, 18,000.

Acton, Ont. has opening for shoe factory, foundry, and machine shops; is near Toronto; and will encourage new industries. Existing factories include Beardmore Tanneries, Acton Tanning Co., and a glove factory: Hydro-electric power. Population, 2,000.

Wilkie, Sask., has openings for flour and oatmeal mill, sash and door factory, creamery, cement block plant, steam laundry, and light manufactures. Power and water plants. Negotiations progressing re industrial sites. Population, 2,000.

Woodstock, Ont.—Industries include Bain Wagon Co., Canada Furniture Manufactures Ltd., Whitelaw Foundry and Machine Co. Hydro-electric power; splendid railway facilities; free sites given, and fixed assessment. Population, 10,000.

Calgary, Alta., has special advantages for the manufacture of boots and shoes, bags, binder twine, brushes and brooms, condensed milk, furniture, farm machinery, gelatine products, lines, paints, stoves, straw paper, tanned leathers, clay products, flour milling and breakfast foods. Shipping facilities—C.P.R., G.T.P., and C.N.R. Provides exemption from taxation on plants employing over 25 hands. Industrial sites for sale at Manchester, 2½ miles out, at $1,200 per acre, including trackage. Hydro-electric power owned and distributed by city at $30 per h.p., natural gas, and plenty of water. Population, 78,000.

Weyburn, Sask., owns a large tract of land for industrial sites, served by spurs from the C.P.R. and G.T.P. Provision made for C.N.R. tracks. Present industries include flour mills, sash and door factory, creamery, foundry, brewery, brick and tile works. Power and light furnished by city. Weyburn would prove a favorable location for flax fibre mills, oatmeal mill, biscuit factory, oil mills, soap factory, twine and cordage mills, mattress factory, starch factory. There are good openings for boot factory, tanneries, carriage factory, wire fence and a furniture factory. Is opposed to a cash bonus or exemption from taxation. Free sites are offered. Population, 5,345.

Yorkton, Sask., has openings for straw hat or oil cake factories, as flax is grown extensively there. Has three railways. Warehouse and factory sites with open trackage, electric light for factories at cheap rates. Population, 4,550.

Hamilton, Ont. claims that manufacturers going there find a large percentage of their raw materials waiting for them. These include iron and steel castings, pig iron, bar iron, machine tools, wire, nails, screws. It has 400 industries, and a labor market supplied with the best type of skilled mechanics.

Guelph, Ont., has eighty manufacturing industries with a total capital of $8,500,000. It is 48 miles from Toronto, on the G.T.R. and C.P.R. Its tax rate per capita is very low. It will give free sites to manufacturers, cash bonuses, and cheap electric power. R. McDonald, Commissioner. Population, 18,500.

Edmonton, Alta. is looking for the following industries:—Boot and shoe, brush and broom, soap works, men's clothing, mittens, gloves, sweaters, hosiery, underwear, paper boxes and bottles, biscuit factory, stove works, builders' hardware, stepladders, washing machines, kitchen cabinets, drain pipe, pottery, lithographing, traction engines, farm tools, strawboard, flax fabric. Civic power, light and water. Industrial sites leased by city for 21 years. Raw materials are hides, grease, horn, hoofs, straw, flax fibre, wood, coal tar sands, clay, pulpwood, moulding sand. Population, 67,243.

Thorold, Ont. has a water front, Niagara electric power, railways, natural gas, cheap sites, and a long list of big industries including The Coniagas Reduction Co., The Ontario Paper Co., (plant cost $1,000,000), The Beaver Board Co., and Pilkington Bros., Ltd., glassmakers. James Battle, commissioner.

ST. JOHN, N.B.

ALTHOUGH the city of St. John made a much greater gain in the value of building permits issued during the first seven months of this year, compared with the like period last year, than any other city in Canada, there is still a scarcity of houses to accommodate the growing population. Secretary Hoag of the Board of Trade has been making enquiries and declares that the supply of houses for residential purposes is entirely inadequate to meet the needs of the city. Real estate men declare that only about 20 per cent. of the new houses that will be required this fall are now under construction. The population of the city is increasing, and has increased during the last year far more rapidly than accommodation has been provided for homes for the new arrivals.

The Banks and St. John.

The banks have faith in the forward movement in the city of St. John. The walls of the new bank of British North America are now rising, and the building which has been enlarged and is being completely remodelled for the Merchants' Bank of Canada is nearing completion. The Bank of Montreal has moved to the premises formerly occupied by the Bank of Nova Scotia, in order that its own building at the foot of King Street may be turned over to the architect and contractor from Montreal who will completely remodel the premises, giving the bank more room and providing it with the very latest in bank furnishings and equipment. It will take four or five months to complete the work.

The C.P.R. and St. John.

It is reported on what appears to be good authority that the Canadian Pacific Railway Co., has purchased a building on the corner of King and Germain Streets, and that when it has secured possession, the building will be remodelled and the various offices of the company, which are now located in three different buildings, brought together under one roof. The C. P. R. has just placed upon the Bay of Fundy route between St. John and Digby a 24 knot flyer, the St. George, brought out especially from the old country to provide part of a much faster service between Montreal and Halifax by this route. The company now has two steamers on the St. John and Digby route, giving a daily double service. During the last two years, the C. P. R. has enormously increased its investments at St. John, and it is paying more and more attention to the development of traffic by this route.

A VIEW OF THE WATER FRONT, ST. JOHN, N.B.

Steamship Service Revived.

The steamship service between St. John and ports on the South Shore of Nova Scotia, which has been suspended for a considerable period, has just been re-established. The steamer John L. Cann, with good passenger and freight accommodation, had gone on the route between St. John and Yarmouth, and will make connections there for ports on the south shore as far as Halifax.

The wholesale trade of St. John had built up a large business on the south shore, and the Board of Trade has been making vigorous efforts to have the steamer service renewed.

New Brunswick Coal.

Although the permanent bridges on the new railway between Minto in the Queen's County coal fields and Fredericton have not yet been erected, temporary bridges are in use, and coal is daily being hauled over the line to Fredericton for use by the Canadian Pacific Railway. The Dominion Bridge Company has just begun placing the superstructures of the permanent bridges, and as soon as that is done and the rest of the work on the line completed, it will be operated by the C. P. R., and the output of coal from the mines greatly increased. The coal is of excellent quality for railroad use, and the C. P. R. itself will be a very important customer.

Evidences of Progress.

The work on the seven-story warehouse which is being erected for the McClary Manufacturing Co., on Water Street, below the Customs House, is being rapidly advanced. The walls of the first two stories are of concrete, and this is being surmounted by five stories of brick. Vassie & Co., Ltd., the dry goods firm who have secured a site and will erect a large warehouse beside that of the McClary Manufacturing Co., are applying for authority to increase their capital to $380,000. The Petrie Manufacturing Co., are also to erect a warehouse on Water Street. The city council has just given permission to have two railway tracks laid in Water St., so that these warehouses as well as those on the wharf on the other side of Water Street, may be better served for traffic purposes. The railway traffic in the south end of the city has grown so much that the city and the Intercolonial Railway are endeavoring to provide more accommodation for cars and are finding it difficult to secure the necessary space.

A Very Busy Year.

There has been no complaint in the Province of New Brunswick this year about scarcity of work for either mechanics or laborers. It has been a very busy year, so much so that when nine saw mills at St. John ceased operations because of a dispute about wages, the men found no difficulty in getting other work. There has never been a year there was less complaint on the score of inability to secure work by any class of men, than there has been thus far in the present year. When to this is added the fact that the farmers are gathering an excellent hay crop of good quality, and are promised a large yield of grain, roots and vegetables, and that the fishermen along the shores of the province have had a generally successful season, it will be seen that the industrial and commercial outlook in New Brunswick is excellent. It is worthy of note that the ready-made farm scheme is being worked out with success, and there is a gradual increase in the number of people taking up farms. The Provincial Department of Agriculture has decided to give special encouragement for the cultivation of alfalfa and excellent results are expected from this source.

R. McDONALD,
Industrial Commissioner, Guelph.

LIVELY LONDON.

DESPITE the universal financial stringency, London, Ont., is experiencing hitherto unprecedented activity, particularly in the erection of new buildings of almost every description. Reports of twenty-one of the larger cities of the Dominion's building permits for the first six months of the year now to hand, provide substantial evidence of London's progress in this direction, as compared with other cities. Only one Canadian city shows a larger percentage of increase over the first six months of 1912 than London. The amount expended in new buildings up to the end of June this year was $554.269 more than was put into new buildings during the same period last year. Only two Canadian cities can show a larger amount of increase in actual value of buildings during the same periods, while a few have to record a decrease in this year's building as against the same period last year. The total amount of the seven-months ending July 31st is $1,192,554.

Falling in line with many ambitious cities of the continent, London is organizing a thoroughly representative body of the leading financial, commercial, industrial, professional and educational interests of the city, devoted to co-operative plans of civic improvement and publicity. The City Council and the Board of Trade are the moving spirits in the matter, while the hearty co-operation of many business bodies and firms is assured.

CORNER IN LONDON MARKET.

LONDON INDUSTRIAL AND ART SCHOOL.

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Vol. X. AUGUST 21, 1913 No. 8

THE MUNICIPAL EDUCATIONAL PROVISION.

THE editorial pages of the present issue of Canadian Machinery are almost wholly devoted to data relative to acquirement by towns and cities throughout the length and breadth of our Dominion of industries which shall contribute to their growth and development, and incidentally add their quota to the development, wealth and well being of the country as a whole.

Hand in hand with industry in all lands, and, of course, more particularly in those of older and more mature civilization, there is and has been in varying degree, a more than ordinary effort put forth to provide for not only the educational uplift of the worker, but in addition, to show him how imperative it is from a personal, community and national point of view, that he take advantage of the opportunities offered and the facilities provided .

What strikes us as being lacking in communities in spite of the many other desirable features which appeal to manufacturers bent on locating a plant, is this all-important matter of education, commercial and technical, although, perhaps in a majority of cases, the latter may be that alone unprovided. We talk somewhat loosely, it would seem of skilled and unskilled labor, forgetting all the while that there is an efficiency achievable with the latter, of as much value commercially as with the former. Investigation relative to "Scientific Management" amply bears out our contention, therefore, whether the establishment of an industry means the employment of a proportionately high percentage of unskilled labor, so called, or otherwise, from the manufacturers point of view, if he is to succeed in his enterprise, a certain degree of intelligence must be forthcoming on the part of his employees, however, classified.

The work of an Industrial Commissioner and the Civic Board of a Municipality may not and does not cease with respect to an industry, immediately the Agreement for its location and establishment has been signed and sealed. The disposition to put it up to the proprietor or Board of Directors of an industry secured, to make the venture a success is both mean and unreasonable, and in many cases reacts with untoward effect on the community concerned at a later date. An added responsibility attaches to the ratepayers of a town or city indirectly, and directly to its rulers, which involves co-operative effort on their part, in spite of capacity for success inherent in and due to the personnel of the industry's management. Much may be done to enhance the success ,otherwise achievable, and in no feature will the effort put forth produce results equal to that of educational provision.

Every manufacturer realizes to-day, that intelligent application to his task, is needful on the part of the operative, in every capacity, if he, the employer, may meet fair competition on equal ground. The acquirement of intelligence is by way of education in some form or other, and instead of there being skilled and unskilled labor in our enterprises and undertakings, there really exists but the skilled feature, only in varying degree.

An ordinary common school or elementary commercial education provision is a requirement with which every municipality casting about for industries should be equipped, not only for the education of an operator's family, but for the operator himself if need be. Further, technical education should be kept well in the forefront of schemes propounded for the advancement and well being of a municipality and its citizens. Existing provision for technical education of employees, or prospects and facilities that may lend themselves to the establishment of courses of instruction in this direction, carry more weight with prospective manufacturers when seeking to locate a plant, than town and city officials generally realize, and where attractions are otherwise about equal, a blank is usually drawn by the municipality lacking this feature.

The Commission appointed to investigate and report on the subject of technical education for our people, made, in a preliminary statement published some few months ago, suggestion that ample and widespread assistance by way of grants be placed at the disposal of municipal and educational authorities, within whose bounds industrial enterprise was being propagated and encouraged.

May we hazard the opinion that industrial commissioners actively prosecute and bring to a successful outcome, their claims, to a share of the proposed expenditure on behalf of technical education, commensurate with their importance as a live industrial and generally progressive centre.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

	Mont'l.	Tor'to.
Foundry No. 1 and 2, f.o.b., Midland	$18 00	$16 50
Grey Forge, Pittsburg.	.....	14 25
Lake Superior, charcoal, Chicago	.....	14 50
Canadian f'dry, No. 1..	$20 50	$20 50
Canadian f'dry, No. 2..	20 00	20 00
Middlesboro, No. 3....	20 00	21 50
Summerlee, No. 2	22 00	26 50
Carron, special	22 50	.....
Carron, soft	22 00	.....
Cleveland, No. 1......	19 25	22 00
Clarence, No. 3	20 00	21 00
Jarrow	.....	23 50
Glengarnock	.....	26 00
Radnor, charcoal iron.	30 00	34 50
Ferro Nickel pig iron (Soo)	.....	25 00
Staveley, No. 1	20 00	22 50
„ No. 3	20 00	22 00

BILLETS.

	Per Gross Ton.
Bessemer billets, Pittsburgh ...	$27 00
Open hearth billets, Pittsburgh.	27 00
Forging billets, Pittsburgh	34 00
Wire rods, Pittsburgh	28 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto..	2.10
Steel bars, f.o.b., Toronto........	2.20
Common bar iron, f.o.b., Montreal.	2.15
Steel bars, f.o.b., Montreal.......	2.25
Bessemer rails, heavy, at mill....	1.25
Iron bars, Pittsburgh	1.60
Steel bars, Pittsburgh, future	1.40
Tank plates, Pittsburgh, future...	1.45
Beams, Pittsburgh, future	1.45
Angles, Pittsburgh, future	1.45
Steel hoops, Pittsburgh	1.50

F.O.B., Toronto Warehouse.	Cents.
Steel bars	2.30
Small shapes	2.40

Warehouse, Freight and Duty to Pay.	Cents.
Steel bars	1.85
Structural shapes	1.95
Plates	1.95

Freight, Pittsburgh to Toronto.

18 cents carload; 21 cents less carload.

BOILER PLATES.

	Mont'l.	Tor'to.
Plates, ¼ to ½-in., 100 lbs.	$2.35	$2.35
Heads, per 100 lbs.........	2.65	2.95
Tank plates, 3-16 in.	2.60	2.60
Tubes, per 100 ft., 1 inch	9.50	8.50
" " 1¼ in.	9.50	8.50
" " 1½ "	9.50	9.00
" " 1¾ "	9.50	9.00
" " 2 "	8.75	8.75
" " 2½ "	11.15	11.50
" " 3 "	12.10	12.00
" " 3½ "	14.15	14.50
" " 4 "	18.00	18.00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Stove bolts	80 & 7½
Machine bolts, ⅜ and less	65 & 5
Machine bolts, 7-16.......	57½
Blank bolts	57½
Bolt ends	57½
Machine screws, iron, brass	35 p c.
Nuts, square, all sizes.....	4c per lb off
Nuts, Hexagon, all sizes..	4¼ per lb off
Fillister head	25 per cent.
Iron rivets	60, 10 p c off
Wood screws, flathead, bright	85, 10, 7½ p c off
Wood screws, flathead, brass	75, 10, 7½ p c off
Wood screws, flathead bronze	70, 10, 7½ p c off

National-Acme "Milled Products."

Sq. & Hex Head Cap Screws	65 & 10%
Sq. & Hex Head Cay Screws	65 & 10%
Rd. & Fil. Head Cap Screws	45-10-10%
Flat & But. Head Cap Screws	40-10-10%
Finished Nuts up to 1 in. ..	75%
Finished Nuts over 1 in. ..	72%
Semi-Fin. Nuts, up to 1 in...	75%
Semi-Fin. Nuts over 1 in.....	72%
Studs....	65%

Discounts f.o.b., Montreal.

WROUGHT IRON PIPE.

The following are Toronto jobbers' discounts on pipe in effect from April 21, 1913:

	Buttweld		Lapweld	
Standard	Black	Gal.	Black	Gal.
¼ ⅜ in.	62	47	....	....
½ in.	68	58	....	....
¾ to 1½	71½	61½	68½	58½
2 in.	71½	61½	68½	58½
2½ to 4 in. ..	71½	61½	70½	60½
4½ to 6 in. ..	....	....	71½	61½
7, 8, 10 in. ..	....	....	66	54

X Strong P. E.

¼, ⅜, ½in. ..	56½	46½	....	....
¾ to 1½ in. ..	67½	57½	....	....
2 to 3 in.	68½	58½	....	....
2½ to 4 in. ..	....	....	65	55
4½ to 6 in. ..	....	....	64	56
7 to 8 in.	....	....	55	45

XX Strong P. E.

½ to 2 in.	43	33	....	....
2½ to 4 in. ..	....	....	43	33

PRICES OF WROUGHT IRON PIPE.

Standard.		Extra Strong.		D. Ex. Strong.	
Nom. Diam.	Price. per ft.	Sizes Ins.	Price per ft.	Size Ins.	Price per ft.
⅛in	$ .05½	⅛in	$ .12	½	$ .32
¼in	.06	¼in	.07½	¾	.35
⅜in	.06	⅜in	.07½	1	.37
½in	.08½	½in	.11	1¼	.52½
¾in	.11½	¾in	.15	1½	.65
1 in	.17½	1 in	.22	2	.91
1¼in	.23½	1¼in	.30	2½	1.37
1½in	.27½	1½in	.36½	3	1.86
2 in	.37	2 in	.50½	3½	2.30
2½in	.58½	2½in	.77	4	2.76
3 in	.76½	3 in	1.03	4½	3.26
3½in	.92	3½in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4½in	1.27	4½in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.86	...	.....
7 in	2.38	7 in	3.81	...	.....
8 in	2.50	8 in	4.34	...	.....
8 in	2.88	9 in	4.90	...	.....
9 in	3.45	10 in	5.48	...	.....
10 in	3.20	....	....	...	.....
10 in	3.50	....	....	...	.....
10 in	4.12	....	....	...	.....

IRON PIPE FITTINGS.

Canadian malleable, 40 per cent.; cast iron, 65; standard bushings, 70; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 75; malleable, lipped unions, 65.

COKE AND COAL.

Solvay Foundry Coke	5.95
Connellsville Foundry Coke	5.45
Yough, Steam Lump Coal	3.93
Penn. Steam Lump Coal	3.63
Best Slack	2.95

All net ton f.o.b. Toronto.

OLD MATERIAL.

Dealers' Buying Prices.	Mont'l.	Tor'to.
Copper, light	$10 50	$11 50
Copper, crucible	12 50	14 50
Copper, uncr'bled, heavy	12 00	12 50
Copper wire, uncrc'bled	12 00	12 50
No. 1 machine compos'n	10 50	11 50
No. 1 comps'n turnings..	9 50	9 50
No. 1 wrought iron	10 00	9 00
Heavy melting steel	8 00	10.00
No. 1 machinery cast iron	13 00	14 00
New brass clippings....	8 50	9 00
No. 1 brass turnings....	7 25	8 00
Heavy lead	3 25	4 00
Tea lead	2 50	3 00
Scrap zinc	3 25	3 50

METALS.

	Mont'l.	Tor'to.
Lake copper	$17.00	$16.25
Electrolytic copper	17.00	16.25
Spelter	5.75	5.55
Lead	5.75	5.15
Tin	45.00	42.00
Antimony	9.75	9.25
Aluminum	22.00	18.00

SMOOTH STEEL WIRE.

No. 6-9 gauge, $2.25 base; No. 10 gauge, 6c extra; No. 11 gauge, 12 extra; No. 12 gauge, 20c extra; No. 13 gauge, 30c extra; No. 14 gauge, 40c extra; No. 15 gauge, 55c extra; No. 16 gauge, 70c extra. Add 60c for coppering and $2 for tinning.

Extra net per 100 lb.—Spring wire; bright soft drawn, 15c; charcoal (extra quality), $1.25.

SHEETS.

	Mont'l.	Tor'to.
Sheets, black, No. 28....	$2 75	$3 00
Canada plates, ordinary, 52 sheets	2 90	3 00
Canada plates, all bright.	4 00	4 15
Apollo brand, 10¾ oz. (American)	4 30	4 20
Queen's Head, 28 B.W.G.	4 40	4 40
Fleur-de-Lis, 28 B.W.G..	4 20	4 25
Gorbal's Best Best, No. 28	4 40	4 40
Viking Metal, No. 28....	4 40	....

NAILS AND SPIKES.

Standard steel wire nails, base ..		$2 40
Cut nails	$2 60	2 65
Miscellaneous wire nails.. 75 per cent.		
Pressed-spikes, ⅝ diam., 100 lbs. .		2 85

FINE STEEL WIRE.

Discount 25 per cent. List of extras. In 100-lb. lots: No. 17, $5; No. 18, $5.50; No. 19, $6; No. 20, $6.65; No. 21, $7; No. 22, $7.30; No. 23, $7.65; No. 24, $8; No. 25, $9; No. 26, $9.50; No. 27, $10; No. 28, $11; No. 29, $12; No. 30, $13; No. 31, $14; No. 32, $15; No. 33, $16; No. 34, $17. Extras net. Tinned wire, Nos. 17-25, $2; Nos. 26-31, $4; Nos. 30-34, $6. Coppered, 75c; oiling, 10c.

MISCELLANEOUS.

	Cents
Putty, 100 lb drums	$2.70
Red dry lead, 5 cwt. casks, per cwt.	6.00
Glue, French medal, per lb	0.10
Tarred slaters' paper, per roll...	0.95
Motor gasoline, single bbls., gal..	0.26
Benzine, per gal.	23½
Pure turpentine	0.60
Linseed oil, raw	0.60
Linseed oil, boiled	0.63
Plaster of Paris, per bbl.	2.10
Plumbers' Oakum, per 100 lbs....	3.25
Pure Manila rope	17

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents.

Montreal, August 18, 1913.—While some houses report pretty fair business, others have found things rather quiet, and taken all round conditions are much the same as they were a week ago. There has been very little doing in the machinery line; but this is a not unusual state of affairs at this season of the year, and dealers look for considerable improvement by the end of September.

Pig Iron.

The pig iron market is fairly steady. Prices remain low, and, although Canadian foundry pig has advanced 50 cents per ton, at present prices furnaces are making very little money. Drummond, McCall & Co. No. 1 furnace at Midland has been closed down for the past four weeks owing to the present unremunerative prices ruling, and No. 2 furnace is only working on contracts placed several months ago.

Metals.

Copper remains steady for the present at last week's prices, but is likely to advance in the near future. Statistics just published show that the output of the Lake Superior district for July last was 38 per cent. lower than for the preceding month, and was the smallest monthly production in ten years. The main cause of the decrease was, of course, the strike which started towards the end of July. Spelter shows a slight decline, while tin and lead remain unchanged. Steel mills throughout the country are mostly working to approximately full capacity, and the dealers are now beginning to feel the benefit of the Dominion Iron and Steel Co. new rolling mill, which commenced operation last spring. Trade in old metals remains fairly brisk, and it is probable that the present low prices will remain in force for some weeks yet.

Toronto, Ont., August 19, 1913.—While business in machine tools is quiet, there are indications that engineering concerns see good business not far away. The Pollard Manufacturing Co., who a year ago purchased the old Niagara machine shop at Niagara Falls, Ont., and have since done a flourishing business in saws for cutting stone, have prepared plans for a new plant to be built in the fall. This will consist of a machine shop and a foundry. Up to the present this company has been working night and day, but has now pretty well caught up with its orders. The Canadian Fairbanks-Morse Co., Ltd., this week, supplied the Corporation of Chesley, Ont., with a 60 h.p. oil engine to run the waterworks plant. The pumps at Chesley have been in use five years. They were formerly run by a producer gas engine, which will now be used as an auxiliary. A. R. Williams & Co., dealers in machine tools, are expecting to do a big business during Fair Week. At the Toronto Exhibition they will show chiefly motor-driven tools. Special demonstrations will be given on a Warner & Swasey hollow hexagon turret lathe, just to show what this new type of lathe will do. The other large Toronto dealers will not exhibit tools, although the Canadian Fairbanks-Morse Co. are expected on the ground with a show of pumps and oil engines. The General Supply Co. of Adelaide Street, who do a large machine tool business, are sharing the slackness with other firms, yet report fair trade in supplies.

Steel.

The feeling in the market just now is that manufacturers are getting quite close to the time when they will be compelled to buy pig iron, bars, sheets, etc., to keep their businesses going. So far their aloofness has not resulted in any reduction of prices. Dealers are getting quite a lot of inquiries just now, chiefly from stove makers. Many manufacturers, however, have bought their sheets for the remainder of the year. It is expected that the demand for this commodity will be as heavy this fall as it was last year.

Metals.

A fair amount of business is being done in metals. The market is almost featureless this week. Tin has risen $2 a ton. In the old material market, heavy melting steel has gone up $2 a ton, owing mainly to supply and demand. Brass clippings and turnings and tea lead have gone up in price.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Engineering

North Sydney, N.S.—R. Musgrave has begun to build a new machine shop.

West Vancouver, B.C.—F. J. Peters, 837 Hastings Street, has plans for a new $20,000 garage and repair shops for D. S. McLaghian, Eburne, B.C.

North Vancouver, B.C.—The Canadian Pacific Railway Co. has purchased the Lonsdale Estate, on which it will erect shops, roundhouses, etc.

Bridgeburg, Ont.—The Tuttle & Bailey Mfg. Co., New York, makers of registers, ventilators, etc., who were reported to be erecting a plant at Bridgeburg, have not yet prepared plans.

Calgary, Alta.—The Government of Province of Alberta is erecting a garage to cost about $6,000. It will be one storey, 32 x 74 ft. M. Calder is superintendent Public Works Department.

Sydney Mines, N.S.—At the plant of the Nova Scotia Steel & Coal Co. a new 50-ton open-hearth furnace equipped with Blair patent water-cooled port ends is nearly completed. It will be supplied with gas by an installation of Crapman mechanical gas producers.

Dartmouth, N.S.—The Starr Manufacturing Co., Ltd., which for forty years has been a prime factor in the industrial life of Dartmouth, and whose output has made its way into all parts of the world, seems likely to soon give place to a new and greater concern—the Starr Iron and Steel Corporation, Ltd.

New Westminster, B.C.—The foundations, caps and joists of the new plant of Heaps Engineering Co., Ltd., are erected. The main building, 410 ft. long, by 90 ft. wide, is two-thirds finished. The outlay will considerably exceed $35,000. The new plant will be in operation in the fall.

Brantford, Ont.—Industrial Commissioner Emerson considers it very likely that the Coniagas Reduction Co. plant, which will be moved from Thorold, will locate in this city. A very attractive proposal has been made to have this big smelting company locate here. The company's plant, which will be thoroughly modern and up-to-date, will mean an outlay of about $250,000, and about one hundred and seventy-five men will be employed.

Port Colborne, Ont.—Extensive yards with roundhouse and machine shops are to be built here by the Grand Trunk Railway Co. N. Fergusson is superintendent of the construction department, Montreal.

Ottawa, Ont.—A. H. Coplan & Co., manufacturers of hard iron, semi-steel, brass, bronze and aluminum castings, are trying to get an exemption from the Council of Hull, Que., after which they will erect a new plant in that city.

Toronto, Ont.—Fire broke out in the building of the United Shoe Machinery Company's building at 122 Adelaide Street West, last week, resulting in a loss of $1,800—$300 to the building and $1,500 to the stock.

Fort William, Ont.—The Fort William Brass Foundry, which was recently destroyed by fire has been re-organized under the name of the Varlow Foundry Co., Ltd., with a capital of $40,000. The new plant is already in operation with a staff of fifteen brass molders. The prospects are bright.

Sorel, Que.—The Sorel Iron Works, Ltd., is moving its plant to Maisonneuve, Que., and will add to its present business of manufacturing boilers, engines, etc., a department to manufacture automobiles. The new name of the company will be Oxford Motor Cars & Foundries, Ltd.

Sarnia, Ont.—The Imperial Oil Company, the Canadian branch of the Standard Oil, has started the big job of razing many stills and other old machinery at its big plant here. For the past few years the business has developed very fast, and with the additio of the big pipe line from Toledo to Sarnia, the plant will be greatly increased. The old buildings are being torn down and will be replaced with more modern buildings and better machinery.

Electrical

Hull, Que.—The Ottawa & Hull Power Co. has started the erection of a large power house near the Chaudiere Falls.

Calgary, Alta.—The City Council is planning the erection of a power substation. George Craig, engineer.

Quebec, Que.—Workmen are at present being employed by the Dorchester Electric Co. to put up poles and wires for an electric light service into Charlesbourg. The village expects to have an efficient electric light system within the next two weeks.

Kamloops, B.C.—The Seattle branch of Chas. C. Moore & Co., engineers, has secured the contract for furnishing two 1,100 horse-power water wheels for the hydro-electric power plant to be constructed by this city. The Canadian General Electric Co. procured the contract for the switchboard and transformers and the Canadian Westinghouse Electric & Mfg. Co. the contract for the generators. Ducane & Dutcher, Vancouver, are the consulting engineers. Work will be done under direction of Charles C. Moore & Co.

Municipal

Watrous, Sask.—The town has sold $35,000 worth of debentures for waterworks and $35,000 for sewerage.

Souris, Man.—The ratepayers will decide on September 2, the question of raising $40,000 by way of debentures to provide cost of installing electric lights for the town.

New Westminster, B.C.—The city secured an option recently on the plant, mains charter and goodwill of the Westminster Gas Co. for sixty days. The price named in the option is $150,000, of which $20,000 is to be paid in cash and the balance of $130,000 in city debentures. The option was secured by Ald. J. B. Jardine, chairman of the gas committee, and Mayor Gray.

Macleod, Alta., has sold debentures amounting to $336,000, the proceeds to be used for improvement work as follows: For the construction of a sewerage disposal plant in connection with the sewerage system, $50,000; for the extension of the sewerage, $36,000; for the construction and extension of the municipal system of sewers, $23,000; for the construction of a filtration plant and the improvement and extension of the waterworks system, $81,000; for the construction and extension of the waterworks system and the extension and enlargement of the electric light system, $46,000; for the erection and equipping of a building to be used for municipal purposes, $100,000.

Plant Improvement, Steel Co. of Canada, Ltd., Hamilton, Ont.

By C. T. R.

The brief illustrated description here given, covering the main features of the equipment added to the previously well appointed works of the above corporation, serves to demonstrate on the part of our large employers of labor the two-fold attribute of confidence in the great future ahead of our Dominion and of an appreciation of the value of keeping abreast of the march of progress in science and invention as exemplified in the realm of mechanical engineering.

FROM time to time considerable prominence has been given in the editorial columns of Canadian Machinery to investigation and development work undertaken with a view to the simplification of operation, while at the same time increasing the efficiency standard of rolling mill equipment. In our issue of June 5, this year, will be found an illustrated description of an Electrically Driven, Two High Reversing Rolling Mill.

The Steel Co., of Canada, Ltd., have recently made extensive and costly additions to their plant at Hamilton, Ont., which should be of interest to all observers of Canadian industrial development. The use of steel has grown to such large proportions the world over, that its manufacture is carried on in immense plants involving great amounts of capital, particularly in the United States and Germany. The capital invested in all of these modern works is expressed in terms of millions of dollars, and the output in terms of hundreds of thousands of tons. It is such a plant that has recently been completed and put in operation by the Steel Co., of Canada, who engaged the well-known firm of rolling mill engineers, the Morgan Construction Co., of Worcester, Mass., to design the entire equipment. The Morgan Company have designed and built about seventy plants in the United States, England, Germany, France and other countries, and their mills are to be found in every large and successful works of the first named.

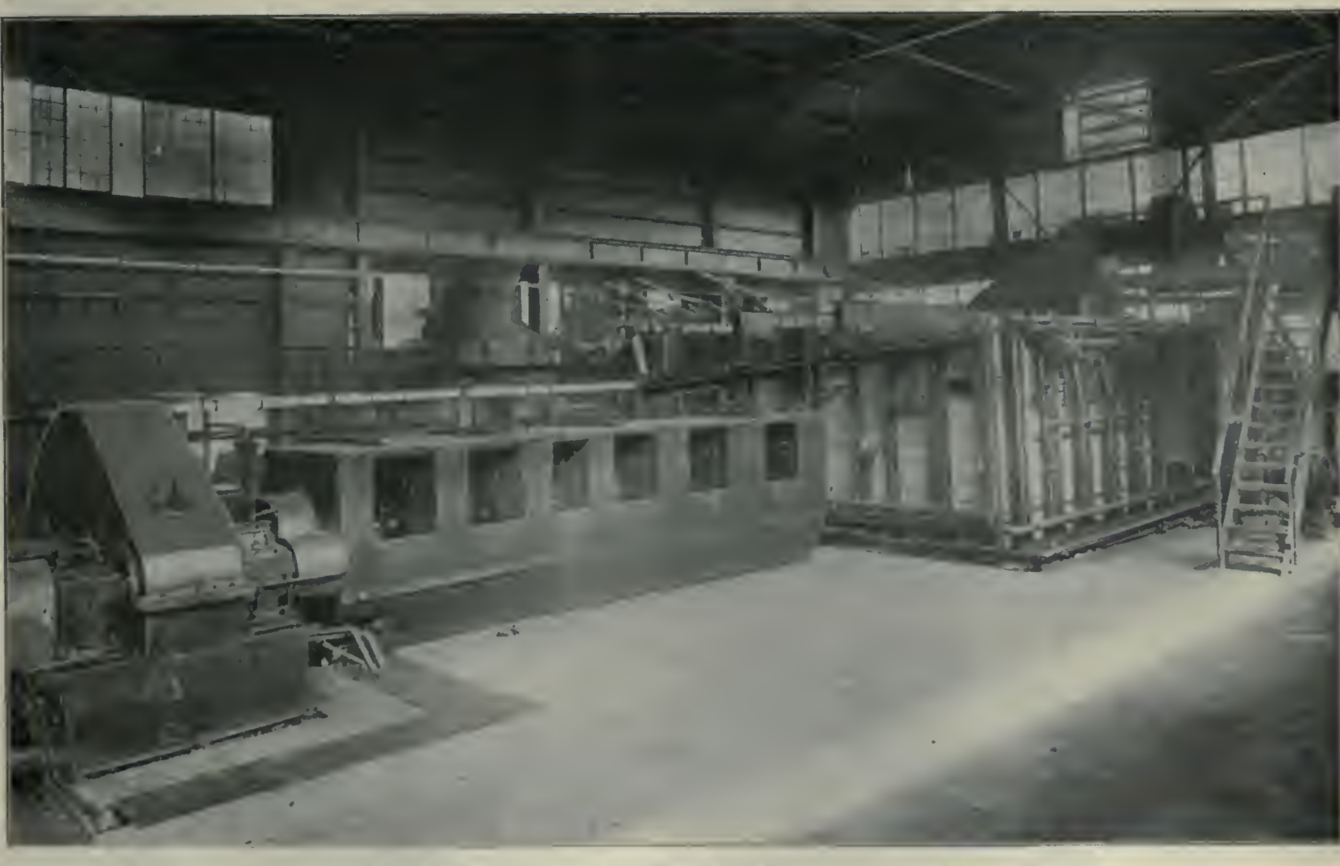
The Electrical Feature.

The new mills at Hamilton, Ont., therefore, embody the widest experience and latest development in steel rolling mill construction. Advantage has been taken of the electrical power supplied by the Dominion Power & Transmision Co., to drive the new mills, and it is expected that the cost of power will be equal to the cost at plants in the States more favorably located with reference to coal fields. The roll trains as well as the auxiliary machinery such as roller tables, cranes, pumps, transfers, etc., are driven by electricity. The total number of electric motors installed in the new mills, aggregate about fifty, ranging in size from a massive ten thousand horse power reversing motor to a diminutive ten-horse power unit.

A large part of the alternating current used is converted to direct current where conditions made the use of direct current advisable. The equipment of rotary converters, static transformers and special motors, make the electrical installation one of the most interesting and noteworthy yet installed in the Dominion, and it is particularly interesting to record that it was all made in the City of Hamilton by the Canadian Westinghouse Co.

Output Capacity Increased.

Heretofore the Steel Co. of Canada have been making on a small scale only a portion of their steel requirements. The new mills, together with increased

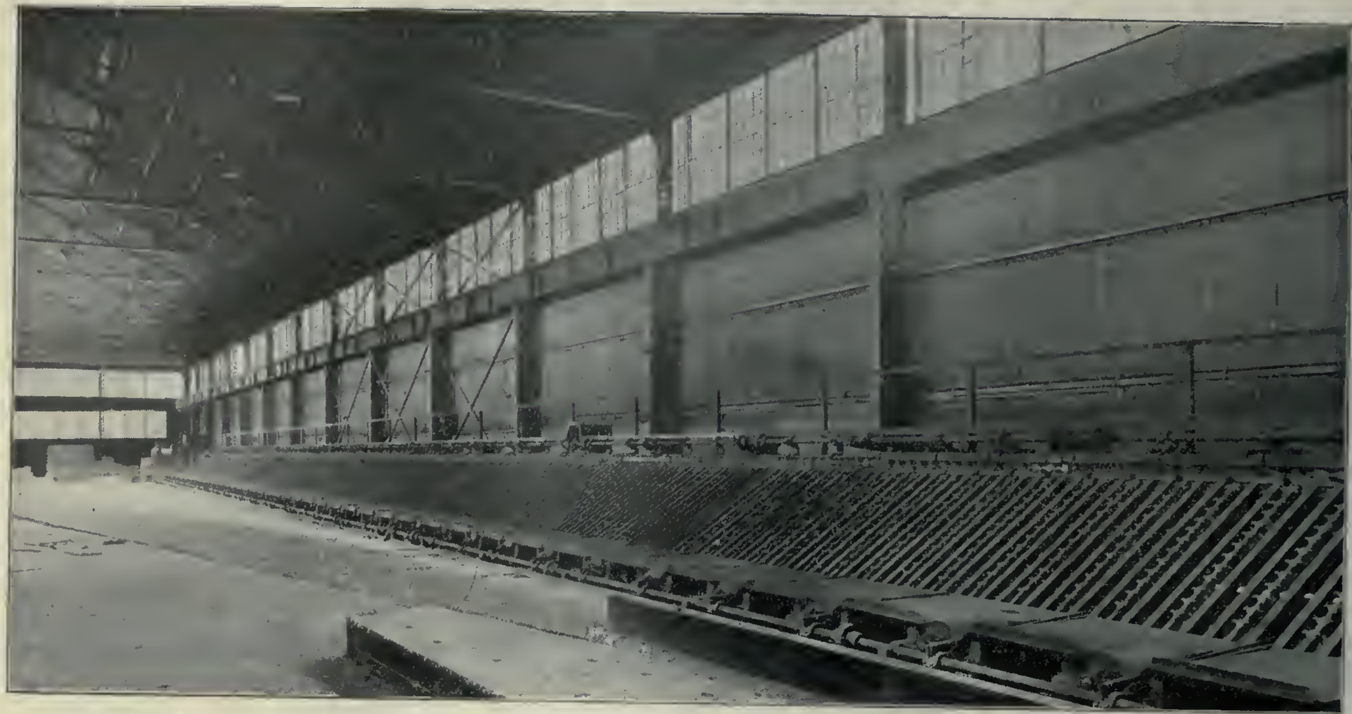


ROD MILL HEATING FURNACE STEEL COMPANY OF CANADA PLANT, HAMILTON, ONT.

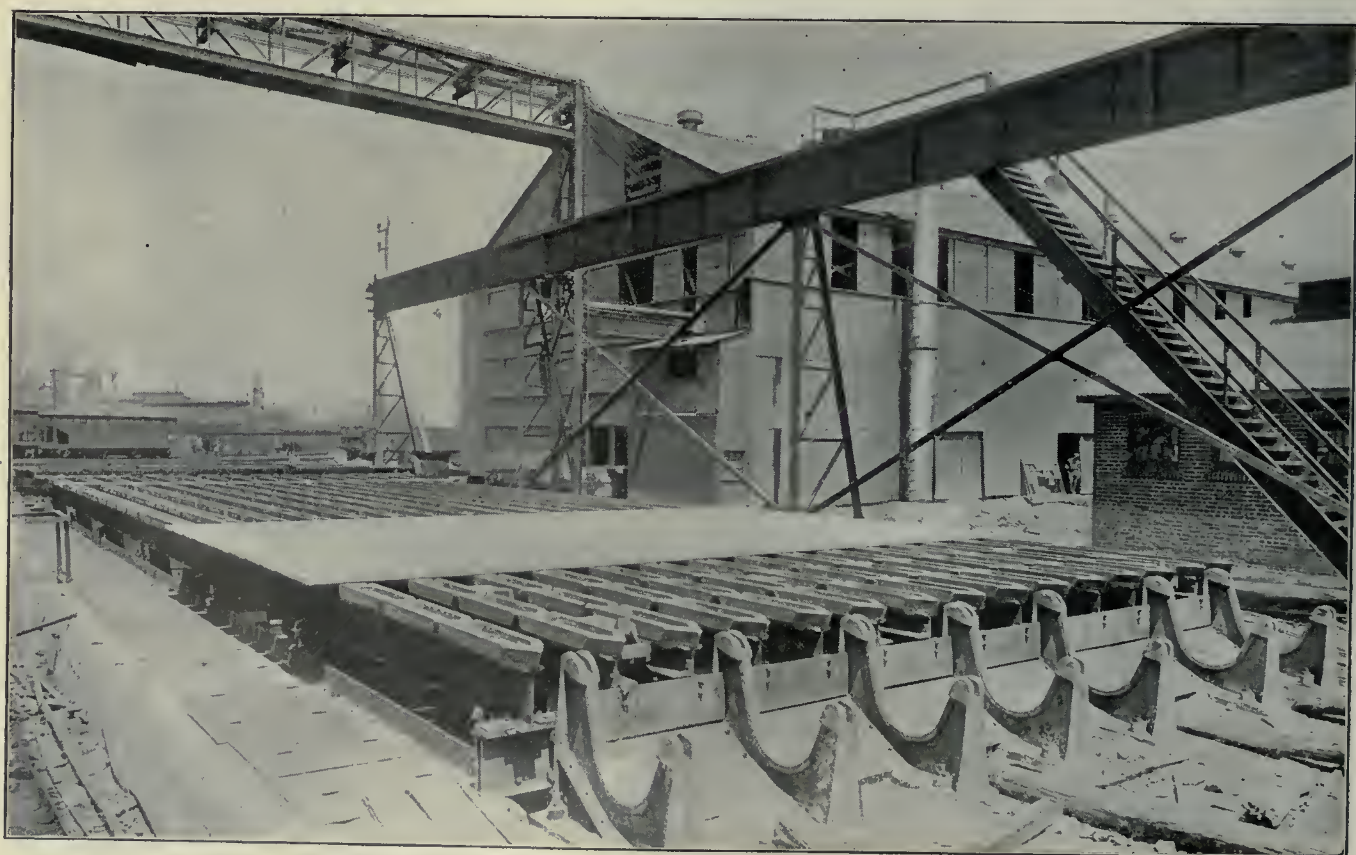
steel melting capacity just finished, enable them to supply their various large departments with raw steel in the shape of billets, blooms, slabs, bars and wire rods. All of the recent additions have been planned with a view to early and still greater extension to keep pace with the rapidly growing market for steel products.

Modern rolling mills are really automatic machines on a large scale, one machine sometimes covering an acre or more of ground, and operated by a few men almost entirely without hard muscular labor. Although the material being worked consists of red hot steel, first in large masses and later in small sections travelling at great speed, the operators suffer little from heat, and are exposed to very little danger from burns.

A detailed description of the mills is not available, but we offer seven photographs which give an excellent idea of the magnitude and character of the construction. The work illustrated consists of three separate units as follows:



COOLING BED OF BAR MILL—STEEL COMPANY OF CANADA PLANT, HAMILTON, ONT.



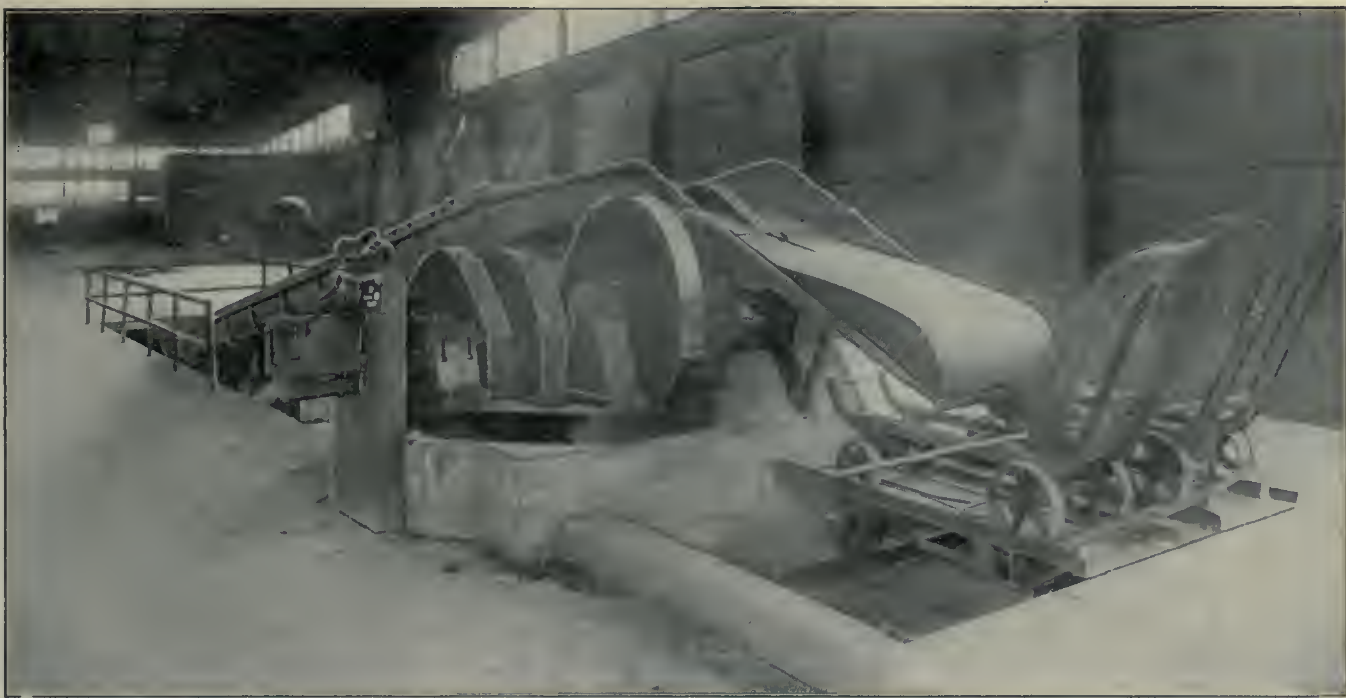
BILLET HOT BED—STEEL COMPANY OF CANADA PLANT, HAMILTON, ONT.

Mill Features.

One two-high reversing bloom or cogging mill for reducing 4,200 pound ingots to slabs of any width up to 24 inches, and blooms from 4 in. x 4 in. to 10 in. x 10 in. The capacity of this equipment is 300,000 tons per year, and its builders, The United Engineering & Foundry Co., Pittsburgh, Pa.

One continuous billet mill for receiving hot blooms direct from cogging mill, and reducing same to 1¾ in., 2 in. and 2½ in. square billets, or equivalent sections of flats. The product of this mill is cut by a flying shear as it issues from the mill in lengths from 15 ft. to 30 ft. as desired. The capacity is 300,000 tons per year, and the builders, the Morgan Construction Co., Worcester, Mass.

One continuous wire rod and bar mill for producing wire rods from No. 5 size up to any size required, and accurately rolled bars from ¼ in. to 1 in. round and equivalent sections of squares, flats, half-ovals, angles, etc.



DELIVERY END OF ROD BUNDLE CONVEYOR—STEEL COMPANY OF CANADA PLANT, HAMILTON, ONT.

Wire rods are rolled by the pure continuous process, and the steel is not touched by hand from the time the billets leave the stock pile until the coiled rods are taken from the bundle con-

CONTINUOUS BILLET M ILL—STEEL COMPANY OF CANADA PLA NT, HAMILTON, ONT.

veyor. 300 lb. billets are used in 30 ft. lengths, and finished into one piece of coiled No. 5 rod, 2,700 ft. in length. As two strands are rolled at one time, more than a mile of rod is produced each minute, and the capacity of the mill is 100,000 tons of wire rods per annum. By reason of improvements recently perfected by the designers, the rods produced are of superior finish and retain the well-known superior softness and temper produced only on continuous mills.

COGGING AND BILLET MILL BUILDINGS—STEEL COMPANY OF CANADA PLANT, HAMILTON, ONT.

Special arrangements heretofore found impracticable have been successfully made in the rod mill for the production of merchant bar shapes requiring accurate section, such as bolt, rivet and spike stock. The capacity of the mill when rolling these bar sections is about the same as when rolling wire rods. The Morgan Construction Co., Worcester, Mass., were the builders of this rod mill.

The buildings, which are all of fireproof construction, were erected by the Hamilton Bridge Works Co., and are perfectly lighted day and night.

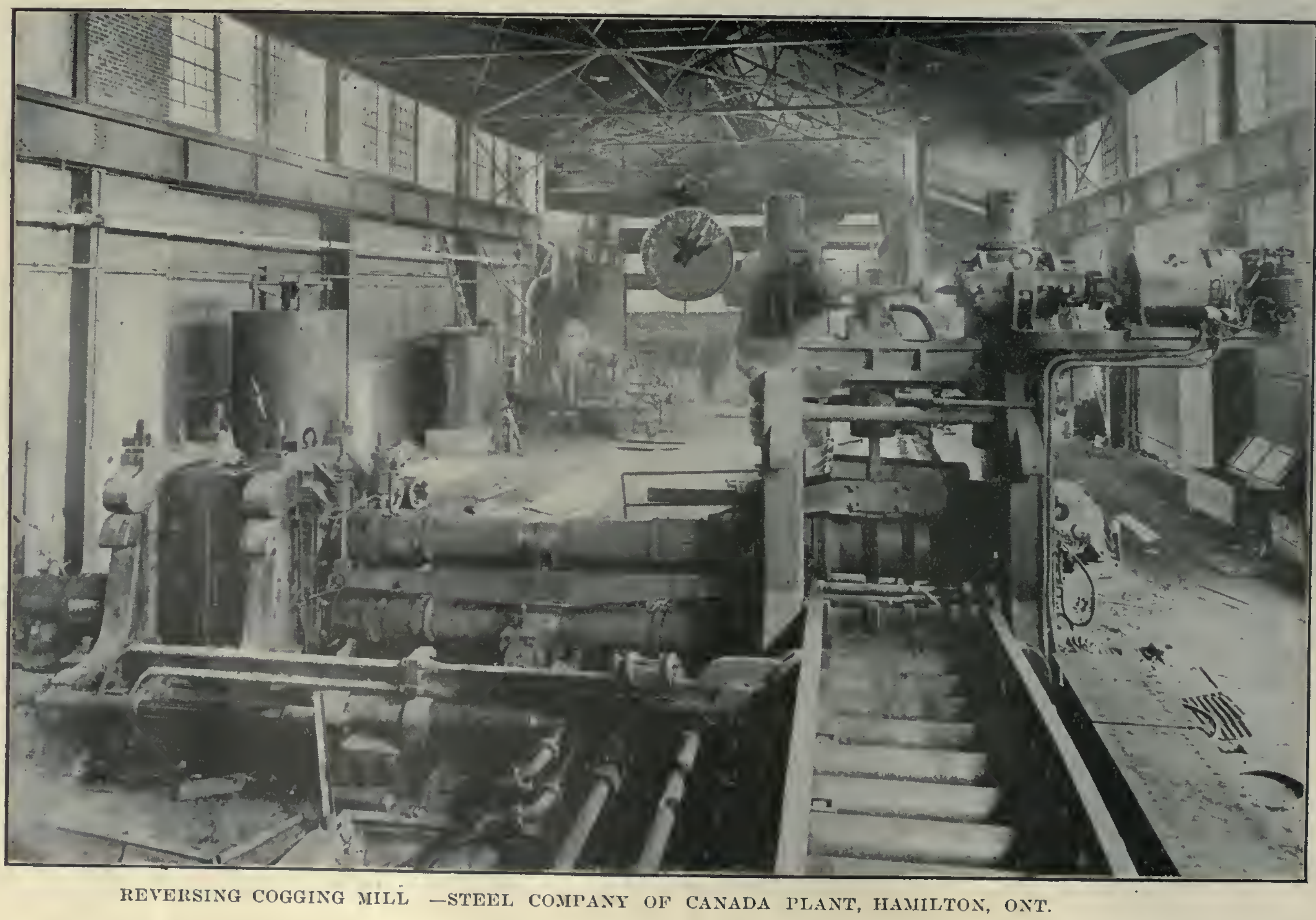
Crushers, elevators and storage bins have been installed at each mill for coal employed for making gas, and every well proved mechanical device for saving labor and insuring the comfort and safety of the workmen has been generously provided.

SCORES MONTREAL HARBOR CONGESTION.

SPEAKING of the grain blockade at Montreal, Mr. A. A. Wright, managing director of the St. Lawrence and Chicago Steam Navigation Co., said: "Montreal as a national harbor is a disgrace to the community." According to Mr. Wright there are about 1,500,000 bushels of grain floating in Montreal harbor. It takes from three to five days to clear a boat from port, while under ordinary circumstances it should take about a day.

The blockade at Montreal has a far-reaching effect, and is responsible for a similar condition at the various ports along the lakes, owing to the fact that so many boats are tied up. The elevators at Port Colborne are loaded to capacity and have been for some time for this reason.

When asked whether his company would press any extra boats into service to handle the crop, Mr. Wright said, "There is no use. We can't get the boats we now have running unloaded." The entire Merchants' fleet runs a full season, and consequently further arrangements are not necessary.



REVERSING COGGING MILL —STEEL COMPANY OF CANADA PLANT, HAMILTON, ONT.

The Theory and Practice of Screw Cutting on the Lathe

By J. Davies

The author of this series of articles intimates his intention of making the information sufficiently simple and clear, that apprentices and others with only the four rules of arithmetic at their command will be able to intelligently grasp the data and apply it in practice.

WHEN cutting short threads, the tool is generally carried back to its starting place by means of a crossed belt, which reverses the lathe, but, in a very long job, this would be a serious waste of valuable time.

Engaging the Nut.

The quickest means of taking the saddle back is by hand, but in doing so we must determine the exact time and place for putting in the nut for the next cut.

(1).—When the number of threads required to be cut can be divided by the number of threads on the leading screw without a remainder, the nut can be engaged at any time or place.

(2).—When the leading screw makes two, three, or any number of complete revolutions to one revolution of the face plate, put a mark on the job or face plate with the carriage up against the headstock; then, on every revolution of the face plate, when the mark comes to a given place, the nut can be engaged.

On a slow running job, put a mark on top of the face plate, and another on top of leading screw, then when both marks are on top together, the nut can be engaged, the saddle is touching the headstock at a definite starting place.

In all other cases, put down the pitch in fractional form. If the pitch to be cut is a complete number, such as 4, 5, 6, threads per inch and so on, then the numerator of the fraction representing the pitch is the least number of inches the saddle must travel, after taking the nut out of gear, before it comes to the right place to put it in again.

If the thread to be cut does not contain a complete number of threads per inch, find ratio, or refer to the ratio already found in working out the wheels. The numerator of the ratio will represent the least number of revolutions your leading screw must make after taking out the nut before you can put it in again.

Example. — It is required to cut a screw $5/8$ pitch with a leading screw five threads to the inch.

$$\frac{5}{8} \times \frac{5}{1} = \frac{25}{8} \quad \frac{\text{No. of rev. of guide screw}}{\text{No. of rev. of job.}}$$

=5 inches.

Put the saddle against the headstock, packing piece, or other means of definitely locating the starting place, measure on the lathe bed the number of inches required, or some multiple of same according to the length of screw to be cut, stop the lathe at the mark on the bed, and run the carriage back to the starting place for a fresh cut.

TYPES OF MANAGERS.

By a Foreman.

THE engineering trade, like all others, has men of varied characteristics and temperaments who occupy controlling positions.

System Personified.

Those who have held the position of shop foreman in various shops have come across the manager who is system personified, and who carries that particular card system of his own to extreme and unwarrantable lengths, the shops being flooded with cards for every little detail, and of all the hues of the rainbow. A card system, properly organized, is one of the blessings of good management, each card checking and helping the other, all working to attain economical output and up-to-time delivery, not forgetting the first and all important point, that of being able to find at any moment when necessary actual facts regarding the cost and progress of any particular order which is going through. This last point is one which justifies the adoption of a card system, even if no other reason is taken into account, but care must be taken not to let the card system run the shops, instead of the shops running the system. The system adopted should be one of the items of the works as a whole, and used as a means to an end, without allowing it to assume such importance that everything else becomes subservient to it.

The Tactless Manager.

Again, there comes that type of man who is tactless in his methods of dealing with those under his control, treating them all as numbers and parts of the organization instead of human beings like himself. In the majority of cases he is a man of wide experience, as his disposition has compelled him to be continually on the move from one part of the country to another, the various shops which he has controlled breathing a sigh of relief on his departure. A foreman, like all human beings, has a temperament of his own, and the tactless manager who has only one method for those under him will find his orders carried out under compulsion, instead of willingly as they should be. Just imagine a shop where the foreman himself is tactless. It is very soon in an uproar, every man working against the other, but all united in their common hatred.

The Unreasonable Manager.

Then, there is the unreasonable type to consider, these being by no means in the minority; the most peculiar thing about them usually being that when they are forced to consider their unreasonableness on account of a foreman kicking against it, they own up to it. Should a foreman, however, have an unassuming manner, and not be able to hold his own in an argument, he leads a most uncomfortable life, and from hour to hour wonders what unreasonable thing will be wanted of him next. This results in a good man lost, as however good and efficient a foreman may be in the control of his own department, he will never rest content under unreasonable demands, and will be continually on the look-out for a place where his capabilities will be recognized, and a free hand given him to exercise them, standing or falling by the results attained.

The Conceited Manager.

Lastly, there are the managers who want to know every little detail and happening from day to day in the shops, some portions of the work being even stopped during their absence while awaiting their decision, they thinking that whatever is done will be wrong unless expressly authorized by them. This may be right in a small works, but, even then, the respective foremen should be allowed to use a certain amount of discretion in details. The manager, of course, in accordance with his position, defines the general rules for the works as a whole, any alteration to be put before him for his decision, but if the foremen are allowed latitude consistent with their capabilities, far smoother operation is concerned, each working with the other, the result being increased economy and better results at the year end.

Qualifications in a Nutshell.

The first attributes of anyone holding a controlling position, whether foreman or manager, should be absolute fairness to all, no favoritism shown, and straight forward dealing, coupled with, of course, the necessary knowledge of the branch or branches of the trade controlled, the resulting opinion of those who work for him being the best a man can have, viz., "He is a strict disciplinarian, but always conscientious and never unfair."—Machine Tool Engineer.

EXHAUST VENTILATION.

A SHEFFIELD factory inspector reports that, though exhaust ventilation has been provided throughout the grinding trades, he is not satisfied that it is perfect in all cases. The cyclones are already wearing out by the constant whirling of the dust round the inside, and the corrosion on the outside by the weather. As a substitute for these, brick chambers have been built, connected by a pipe to the chimney stack. They appear to be satisfactory, and to prevent the dust from escaping into the atmosphere.

He regrets that the workmen themselves do not carry out their share of the duties to the full extent, and finds exhaust ducts stopped up owing to improper things being allowed to enter; hoods not properly adjusted; glass in the hoods broken; and sometimes grinding being done with the valve between the hood and the duct closed.

Again, in those places where respirators have to be used, men are frequently found racing stones without them, and others working in the room at the same time. The weekly cleaning does not appear to be done as regularly as it should be done, though special visits of inspection are paid for the purpose of enforcing it.

OPERATION OF ELECTRIC LOCOMITIVES.

APART from the technical features of the motors, control and switchgear, with which the running staff have little to do, the operation of electric locomotives, the Railway News points out, is very simple indeed, there being no indicators to watch, no fire to call for careful and skilled maintenance under every varying conditions, and virtually little for the engine crew to do beyond keeping a good look-out and manipulating switch and rake gear intelligently.

The working parts also are very simple, owing to the absence of pistons and piston-rods, eccentrics, valve motion, etc., while the moving parts of the control are light, easily accessible for inspection and repair; and the working parts as a whole are not subjected to the heavy strains which apply in the case of the steam locomotive.

In maintenance, too, the electric locomotive is superior. The workshop equipment need not be elaborate, and, except for machines for winding armature and field coils and a few special items, a portion of the usual machinery of a steam locomotive works is all that is necessary. A strong feature is also made of the policy of using stock parts, so that it is only at long intervals that an electric locomotive requires thorough overhauling.

GROWTH OF STEEL PASSENGER CAR EQUIPMENT.

THE Wall Street Journal says: In view of the fact that four bills are pending in Congress requiring the replacement of wooden passenger equipment with steel equipment, the Special Committee on the Relations of Railway Operation to Legislation made inquiries as to the process of the construction of steel and steel underframe equipment. Replies from 247 companies operating 227,754 miles of road in the United States, and from roads operating 24,718 miles in Canada were received.

Between January 1, 1913, and July 1, 1913, orders have been placed by railways for 1,140 passenger equipment vehicles. Of these, 1,064, or 93.3 per cent., are of steel construction, and 76, or 6.7 per cent., have steel underframes. The steel and steel underframe passenger equipment in service on the dates named was as follows:

	Steel.	Steel Under-frame.
January 1, 1909....	629	673
January 1, 1910....	1,117	1,098
January 1, 1911....	3,133	1,636
January 1, 1912....	5,347	2,399
January 1, 1913....	7,271	3,296
Increase.		
1913 over 1909....	6,642	2,623
1913 over 1909	1,055%	389%

The approximate cost of replacement of wooden equipment for steel is as follows:

	No.	Av. cost.	Amount.
Postal ...	680	$11,000	$ 7,480.000
Mail & bag.	2,724	10,000	27,240000
Mail, bag. & passenger	679	10,000	6,790,000
Bag & pass	3,757	10,000	37,570,000
Bag or exp	7,431	8,500	63,163,500
Passenger	23,692	13,800	303,257,000
Parlor, sleeping, dining..	6,864	22,000	151,008,000
Business .	774	15,000	11,610,000
Motor. ..	325	20,000	6,500,000
Total ..	49,626	.....	614,619,100
Annual int. charges at 5%..			30,730,900

VANADIUM CAST STEEL.

THE use of vanadium cast steel for frames and other parts of locomotive construction is continually increasing in the United States, and some tests recently carried out on a frame designed for a Pacific type locomotive intended for the Southern Railway have demonstrated the remarkable strength and toughness of the material.

According to the Railway Gazette, the frame was first laid on supports 6 ft. apart and subjected to a series of blows from a dropball weighing 1,400 lb., falling from a height of 8 ft. to 18 ft., without breaking. As a further test a heavier ball, weighing 4,765 lbs., was substituted, and a series of blows ranging from 13 ft. to 14½ ft. was delivered and still it was found that the frame had not sustained a fracture. It had, as a result of the treatment received, assumed a semi-circular formation, but there were no signs of breaking.

It was next stood on end, and subjected to some further blows with the heavier ball from heights of 6 ft., 9 ft., and 12 ft. respectively, still without exhibiting the least sign of a crack or fracture of any kind in the frame. Physical tests showed the material to have an elastic limit in pounds per square inch of 47,500. The tensile strength similarly calculated was given as 80,000; the elongation on 2 in. was 24 per cent., and the reduction of area 39 per cent.

As regards the chemical composition of the material, the constituents of which it was composed emboided various percentages of carbon, manganese, silicon, vanadium, phosphorus, and sulphur. The frame, was of the bar or open type.

BUILDINGS ON C.P.R. LAKE SHORE LINE.

THE contract for the erection of all the buildings on the new Lake Shore line of the C.P.R., giving a double track between Montreal and Toronto, has been let to the John Metcalfe Co. of Montreal, and it is intended to complete all the structures this year so as to have the line open to traffic.

Trenton is to be the divisional point. There a fine station is to be erected with a freight shed nearly a hundred and fifty feet long, enclosed tank with 40,000 gallons capacity, tool house, turn table, twelve stall locomotive house, machine and boiler house, coaling plant and all the necessary buildings required at a divisional point. The station will be of brick on concrete foundation, with slate roof, and be finished in natural wood. The majority of the stations to be built on the line will be of a similar design.

Drill Jig and Fixture Design and Construction

By H. R.

The sketches and data will, the writer hopes, appeal to machine shop superintendents, designers, toolmakers, and novices, as indicating the large place jigs of every kind and for every service occupy to-day in machine shop practice. The present article is the third of a series.

THE illustrations in this section of the series of articles deal with various levers, wheels, etc. As the standardization of parts is a most important item in jig and fixture design and construction, manufacturers should make up standards of their own, which would be fitting to their particular requirements. This would mean a great saving in the cost of production of jigs, etc. If a part of a jig gets broken, when standardized, the replacement can be usually obtained from stock.

No. 56 is a ball lever handle. This is particularly suitable for clamping the work in the centre of a jig, in conjunction with a stud bolt. The ball end is raised up in order to allow plenty of clearance to manipulate same with the hands.

No. 57 is what is termed a binder handle, while No. 58 shows a single-ended ball handle.

No. 59 is a double-ended ball handle or balanced ball handle. The last named, Nos. 58 and 59 are used in very special jig and machine tool work, such as the operation of slides and winding gear.

No. 60 is a suitable hand portion for the balanced ball handle.

No. 61 shows a small hand or thumb wheel. These are often made of cast iron, in various sizes, and can be used with great advantage in the place of wing nuts. A good pressure can be applied by the hand without the aid of wrenches. Sometimes it is well to screw the boss for other purposes.

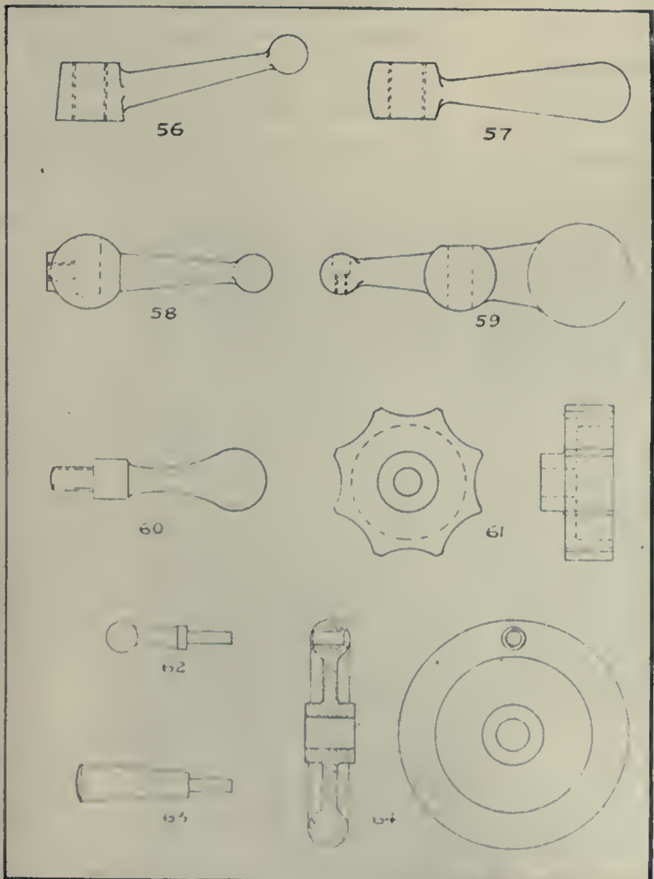
No. 64 is a very common type of hand wheel. This can be also made from cast iron and the sketches No. 62 and 63 show suitable shaped handles for same; these being riveted into the rim of the wheel.

No. 65 is a well designed cast iron hand wheel, used extensively in large jig and fixture work.

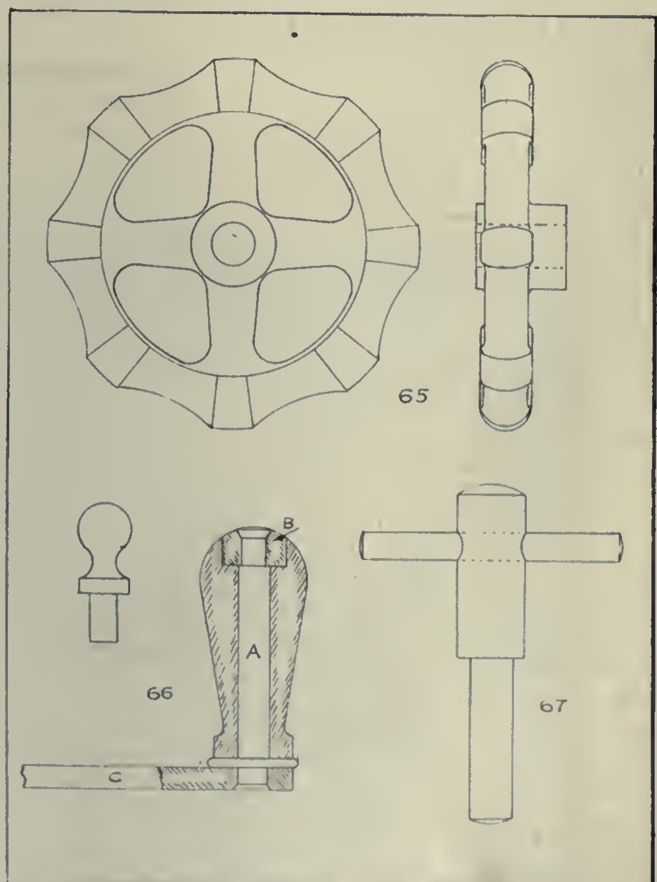
No. 66 is what is called a horn handle. It will be clearly seen that same revolves on the centre spindle (A.) This spindle has a collar (B), and is riveted over to hold same in position. The spindle is also riveted into the lever (C).

No. 67 is known as a stop pin, and can be used in many examples of jig design.

No. 68 is a hand wheel knob.



DRILL JIG FIXTURES.



DRILL JIG FIXTURES.

TAXES OF ONTARIO TOWNS.

A REPORT of the Ontario Bureau of Industries gives the taxes per head of the cities and principal towns of Ontario, as follows:—

	Population.	Municipal Taxes.	Total Taxes.
Port Arthur ...	14,106	$19.01	$25.10
Fort William...	20,644	18.69	23.38
Chatham	10,463	14.18	18.47
Ottawa	90,520	11.91	17.40
St. Catharines..	13,403	12.48	15.62
Toronto	374,666	12.07	17.15
Windsor	18,220	10.78	15.33
London	48,123	10.45	15.13
Brantford	24,084	10.56	14.56
Niagara Falls ..	9,004	10.07	14.20
Stratford	14,596	9.65	13.54
Berlin	15,338	9.01	12.87
St. Ste. Marie..	10,613	7.75	12.82
St. Thomas ...	15,240	8.73	12.77
Galt	10,333	8.48	12.52
Owen Sound ...	12,383	9.12	12.00
Hamilton	82,095	8.77	12.21
Belleville	10,440	9.18	12.30
Peterboro	19,300	7.12	11.60
Kingston	18,828	7.74	11.20
Guelph	15,107	6.28	10.08

POINTERS FOR YOUNG MOULDERS

BE sure there is enough metal in the ladle before pouring the job.

A good apprentice will make a good journeyman.

A number of smaller runners are far better than one large one.

Learn how to calculate the quantity of metal required to cast your work.

Always remember that it is to your advantage to be the best man in the shop.

Keep on good terms with the foreman if you wish to learn all branches of the trade.

Study the job before deciding where it shall be run, and where the riser shall be placed.

Apprentices cannot afford to lose the goodwill or friendship of anyone in their shops.

See that the metal has the clearest flow possible, when entering the mould at the runner.

Do not depend on a riser taking off any dirt; it does not do so. Be sure the mould is clean.

Be at your work first thing in the morning. You may get a superior job on that account.

Be sure that all clamps are sound, and that you have enough weight on the job to resist the strain.

There is no time to learn after you get the position, so begin to learn at once and give up guessing.

No man is fit for the position of foreman unless he knows how to calculate the metal required for a mould.

Do not let metal set in the bottom of the ladle; it spoils the chances of the next job poured from that ladle.

Always allow for runners and risers about 25 per cent. above the quantity of metal required to fill the mould.

Keep the mould joints clean, for a dirty or ragged joint is the forerunner of a run out and a possible waster.

Risers, or flowers, relieve the strain on the mould, and are convenient for feeding any heavy section of a casting.

Be sure the metal is in the right condition for pouring the job; for it is possible to cast a mould too hot as well as too cold.

When you have once made a job successfully, do not vary the method of making it, as in doing so you will be liable to make wasters.

Never allow yourself to think you have learned the entire moulder's trade, for one's knowledge can constantly be increased; no man has yet mastered the moulder's trade.

Do not unnecessarily loosen patterns, for, not only will you loosen parts of the mould, but the pattern will probably suffer damage. All patterns will not stand the hammer.

Castings for different purposes and of different design require different mixtures of metal and different treatment. Think of this, and be sure you are treating the job rightly.

Do not be wasteful in the use of the tools and materials supplied for your use. Your employer has to buy them, and the more he has to spend in this way, the less able will he be to give you an advance in wages.

Do not guess the amount of metal required, it is dangerous, and is the cause of many wasters. It is usually left to the foreman to calculate the amount of metal required for each mould, but there is no reason why you should not learn to do it also, for some day a leading hand or foreman will be wanted, and you should be prepared to fill the place.

Ask the foreman when you are in doubt. Don't "chance it." The foreman is responsible. — Foundry Trade Journal.

TECHNICAL EDUCATION.

SOME curiosity, says the Montreal Gazette, is beginning to be expressed as to when the Technical Education Commission will complete its report. The matter already deposited with the Government consists of four bulky parts, and it is now understood that yet further matter is under way. The Commission has now been in existence for upwards of three years.

Commission Purpose.

In this connection, attention has been called to a peculiar circumstance. When the Hon. MacKenzie King wrote on December 13, 1909, to the Premiers of the several Provinces broaching the subject of a Royal Commission, the letter included the following explicit statement: "It is intended that the Commission shall be solely for the purpose of gathering information."

Two of the Provincial Premiers accepted the proposal on the express understanding that the inquiry should be so limited. Sir James Whitney, in his reply, noted that it was to be solely for the purpose of gathering information, and said: "This being so, I see no objection to the creation of the Commission."

Sir Lomer Gouin, Premier of Quebec, wrote: "We are of the opinion, my colleagues and myself, that anything pertaining to public education—whether subject to special teaching or general teaching—belongs to the Provinces exclusively, and I want to write you so in order that there may be no misunderstanding on that point. As, on the other hand, you give me the assurance that the Federal authorities, in instituting a Commission of Investigation, would simply do it with a view to help the Provincial Governments by having collected information which they would later on put at the disposal of the latter, we see no objection."

When, however, the Order-in-Council constituting the Commission was passed, it went a step further, stating: "The information when obtained to be carefully compiled, together with such recommendations as it may seem expedient to the Commission to make." When the Commission reported, it recommended the spending of a sum of three millions.

In view of these circumstances, some doubt obtains as to when the report will be acted upon, or if in doing so there would be a breach of faith with the Provinces.

DETROIT RIVER CITIES.

FOR several miles on the right bank of the Detroit River, the city of Detroit occupies the shore continuously; on the left bank there are now five settlements: Windsor in the centre, on one side Ford City and Walkerville, and on the other Sandwich and Ojibway. Of these, Sandwich is the oldest, and Windsor is at present the largest. They are connected by an interurban electric railway, but they have no municipal organization or corporate life in common.

As a matter of business enterprise, the people of these different settlements have under consideration a co-operative publicity scheme, to be maintained in common, but to serve the corporate interests of each. This proposed co-operation naturally suggests the question why they should not unite to form one large city, and thus carry on all modes of urban activity under a single municipal organization. The site of this Canadian city would be equal to that of Detroit in extent and availability, and would be quite as interesting historically.

Walkerville, Ford, and Ojibway are essentially manufacturing centres now, but the new city would be or might be made an exceedingly attractive place of residence. With its fine river front and its adaptable hinterland it might become in a few years one of the great cities of Canada.—Toronto Globe.

The Publicity Policies of Our Canadian Towns and Cities

Staff Article

There are here set forth the parts played by the Industrial Commissioners, the Councils and Boards of Trade in securing new industries, and, incidentally, reference is made to the oftentimes stupendous nature of the latter task, the uncertainty existing right up to the actual signing of an agreement, and the obvious disappointment sure to be felt at unsuccessful effort.

TO a European, the idea of a town advertising itself is new. Across the pond, the only towns that advertise are health resorts. On the theory that the acquisition of a new industry by a town is profitable, it has been found advantageous on this continent to advertise the town's good points. There are so many people in the market looking for locations with good markets, good shipping facilities, and plenty of labor, that quite a rivalry has developed between the towns of North America in their endeavor to land new industries.

The Industrial Commissioner.

The work of attracting business of this kind falls to the lot of the town council, who, if the town be of considerable size and enterprising, usually employ what has come to be known as an "Industrial Commissioner," a man whose object is to lay the town's claims before manufacturers who are contemplating building factories. Usually he is a most aggressive individual, able to put up a good fight and with the town's attractions at his finger ends.

The industrial commissioner must cooperate with the council, and vice versa, or he might as well get out. His position is no sinecure, and under the unusual circumstances, his salary is not always very large. His business is to secure new industries for the town, and if he does not succeed, there are aldermen in every council who want to know why. Usually, however, he can claim to have several hanging fire. The expenses incidental to such a department are usually very heavy, and it is up to the commissioner not to antagonize the council if possible. He will find that new industries are the most illusive things in the world. He can work day and night to secure them, and then when surely he has them in his grasp, they slip through his fingers and are gone. New industries cannot be grabbed. They can be courted, and drawn right up to the city's gates.

B. J. McCORMICK,
Industrial Commissioner, Welland.

The industrial commissioner secures a site and figures, then puts the heads of the prospective industry into communication with citizens who can talk blandly, and after that, it rests with the council to concede to the demands of the company, prepare the by-law, and eventually land the new plant within the city limits.

There was an instance in Hamilton recently of an immense industry being se-

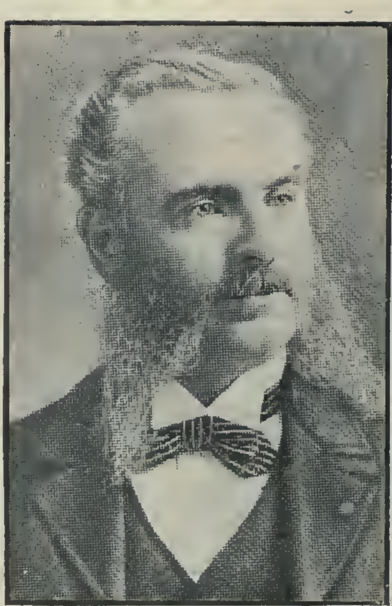
SHIPYARD, DRYDOCKS AND TOWN OF COLLINGWOOD, ONT.

cured by the merest accident. To the west of the city stands the plant of the National Steel Car Co., Ltd., which is now turning out twenty freight cars a day, and employing several hundred mechanics. About two years ago, the Montreal Daily Star published a story to the effect that a new industry would shortly locate in Montreal, to be known as the National Steel Car Co. A Hamilton manufacturer saw the account and remarked that there was no reason why his city should not have the industry. He got in touch with the industrial commissioner, who sent a wire to Basil Magor, the promoter of the concern. The latter promptly came to Hamilton to see what that city had to offer. He was satisfied, and without much more trouble this important industry was snatched from Montreal.. Some industries are not secured so easily. The Goodrich Rubber Co., Ltd., of Akron, Ohio, desired to build a large Canadian branch plant. Negotiations were opened with several cities, and it came to a tug-of-war between Windsor and St. Catharines. Both of these cities exerted every effort to secure this splendid industry, and Hamilton, who had not lost heart did her utmost still to bring it in. The news was wired across the country one day that the Goodrich people had chosen St. Catharines. A by-law was prepared, voted upon, and passed, but for some mysterious reason nothing more was done. A report was circulated later that the company had abandoned St. Catharines and was considering a site at Chippawa. The latest report is that for financial reasons, and because of a strike, the Goodrich Rubber Co. will not build a plant here for the present.

What this disappointment must have meant to the Industrial Commissioner at St. Catharines can be imagined when it is stated that this official is paid on a percentage basis, receiving remuneration only when the industry has been landed. In this case, the Commissioner is a real estate agent who gives only part of his time to the work. The same is true of Welland, and many other large cities in Ontario. On the other hand, the great majority of industrial commissioners are paid salaries from one to two thousand dollars a year, have an office in the city hall, and devote the whole of their time to this work.

No Royal Road to Success.

There is no royal road to success in this profession. Strenuous work is necessary, and plenty of tact. No two propositions are handled in the same manner. Once a concern has been interested, it is necessary for the commissioner to get quickly to work to secure facts concerning ready-made factories or sites which might be suitable. If the building is not just right, he must be ready with the authoritative statement that it can be altered to suit the manufacturer's requirements. The commissioner must be on good terms with the manufacturers already located in this town, and be in a position to call on them for help when necessary. A very busy manufacturer came over from the States recently, who wanted a ready-made factory in a very short time. He is now manufacturing in a certain Ontario town. When he went there first, he intended staying for about an hour, but the commissioner put him in touch with such interesting men, he stayed for a day, and eventually established his plant there.



E. K. BARNSDALE,
Chairman Industrial and Railway Committee, Stratford, Ont.

It might be remarked here that this man first came to the office of "Canadian Machinery." He was known as a maker of hack saws, and required a one or two-storey building, having about 8,000 square feet of floor surface, convenient to railways. Immediately, letters were addressed by that journal to industrial commissioners all over the province, some of whom replied long after the industry had been placed, and some not at all. True, it was only a small plant, but, nevertheless, one which will develop being a branch of a large American industry. The smallness did not prevent the most progressive city in Canada going after it, tooth and nail, and securing it.

In marked contrast to the apathy of some of the larger cities was the attitude of a number of smaller towns. The Board of Trade of Acton, Ont., made a bid for it, and did not cease negotiating until the industry had been placed. Calgary, which was out of the running in this case, owing to its western position, kept the wires busy with its call to this American manufacturer to come west. Here is the Commissioner's businesslike wire:—

"Please advise American firm establishing Canadian branch that City of Calgary offers required floor space in reinforced concrete industrial building, rental 30 cents square foot per annum. Building most modern on continent. Gas twenty cents per thousand. Hydro-electric power one cent per kilowatt

VIEW OF MAIN STREET, WINNIPEG, MAN.

hour. Big market of middle Canadian west accessible. Splendid opportunity. Writing."

Industry Ambition Commendable.

The ambition displayed by some Canadian towns and villages which have never yet known the delight of a good-sized industry is very commendable. Last week the small town of Bradford, Ont., voted on a by-law to grant certain concessions to a manufacturer who will erect a plant for the manufacture of wire screws, and passed it almost unanimously. The citizens were so jubilant, a torchlight procession was held the same night, and the town was en fete to celebrate the arrival of its new industry.

Man-in-the-Street a Booster.

The man-in-the-street is a booster. He seems to have a deep conviction that to grow, his town must get new industries, although on the whole, their acquisition may not enrich him one iota. The writer was chatting with a teamster at Port Dalhousie, Ont., some weeks ago, and made some enquiries regarding the town's industries. The teamster, thinking he was talking to one looking for a site, commenced to hold forth on the unrivalled advantages of Port Dalhousie, its splendid situation at the mouth of the Welland Canal, etc., and concluded by handing the writer over to a town official.

Small Towns Handicapped.

The small town, however, is "up against it" as regards new industries. It has got to have the goods, and must offer unusual inducements before it can get a start. The unfortunate thing is that industries which go abegging to small towns are not, as a rule, the best, and the town which grants big subsidies is liable to find itself "stung." There are notable exceptions, however.

Attention might be drawn to Brampton, Ont., which during the past two years has developed from a small country town into a thriving manufacturing centre. Among other industries, it has the largest furnace foundries in the province, and has arranged for a large engine works. Aurora might also be pointed to as a town which has lately attracted several good industries. The chief argument advanced by these two towns is their proximity to Toronto, and its big market. Then there are lower taxation and cheaper sites to be considered, points that count in favor of the small town.

The Board of Trade Feature.

Apart from the city council and the industrial commissioner, there is another factor in civic progress and prosperity that is equal in importance to each of the foregoing—the Board of Trade, an institution to be found in every Canadian town that has passed the village stage. This should and usually does consist of a body of business men, incorporated for the purpose of promoting measures for developing the general trade and commerce of their town and province. These are men who have lost faith in the old cut-throat methods of doing business, who are broad-minded enough to appreciate the other fellow's suggestions, and are willing to disseminate their own ideas for the benefit of competitors. They are men who devote their time for the betterment of the business community, possessing civic pride, men who devise ways of upbuilding a strong commercial and industrial structure.

It follows then, that the Board of Trade will have for one of its objects the bringing of new industries into the city, and that perfect harmony should exist between the Board, the City Council, and the industrial commissioner. Unfortunately, this is not always the case, resulting in chaos. In a city where the Board of Trade and City Council pull in opposite directions, new industries cannot be expected; where they work in harmony, they contain all the essentials for attracting new business.

Advertising the Town.

Among other things, the Board of Trade usually makes it its business to compile a booklet setting forth the status of the city, so that manufacturers may see at a glance what conditions obtain there. Being business men, they appreciate the value of advertising, and would carry it further if they were only seconded in their efforts every time by the City Council. As it is, their efforts in this direction usually end with a booklet, whereas greater effect might be produced by advertising in the pages of a magazine which reaches the eye of manufacturers.

The literature sent out by Boards of Trade and Industrial Commissioners often shows lack of funds and lack of discretion. To attempt such a crusade, money is necessary for several publications. The first should be an artistic volume, giving a pictorial review of the city, the reading matter taking second place. This should be supplemented by one or two leaflets which state tersely, and in a businesslike manner, the attractions the city possesses. The City of Hamilton has for three years published a book called "The Hamilton Manufacturer," which includes articles on Hamilton written by prominent men, and illustrated with clear photographs. Art paper is used, resulting in a publication worthy of the city from which it came.

Camera Glimpses.

"Camera Glimpses of Port Arthur," arranged by N. G. Neill, ex-industrial commissioner and now of North Battleford, is another example of effective literature along this line. By looking at this, the manufacturer can see at a glance that Port Arthur is no small town. Ottawa has issued a very sensible booklet, containing the correct amount of reading matter, and the facts stated plainly. No manufacturer can be expected to delve into a book of uninteresting matter relating to sports, the town band, and what part the district played in the war of 1812.

MONTREAL HARBOR FROM GRAND TRUNK ELEVATOR.

A commissioner should not be afraid to go outside to secure a good printer for his publicity literature. In many cases the local printer is a bad advertisement for the town. We have received a booklet from a British Columbia town, the first page of which is in the middle, and makes a start with page 13. This is a home product which will amuse the manufacturer. Another western city sent us literature which was a positive pain to read, the accompanying maps and illustrations being cheap and undecipherable.

Such criticism cannot be levelled, however, at every western city. The official handbook issued by Weyburn, Sask., will put many Ontario towns to shame, and Calgary, which must spend an enormous sum on publicity work, has adopted several neat and attractive ideas in its literature. Winnipeg of late has adopted a system of diagrams illustrating the city's growth in ten years, the growth in the number of buildings, in the annual bank clearings, and in the output of its factories. While such a scheme is anything but artistic, it shows at a glance the gigantic leaps Winnipeg has made since 1900.

Hamilton's Official Handbook.

After looking through a pile of such literature sent from all over Canada, the official handbook issued by the City of Hamilton seems to us to embody the facts required by a prospective manufacturer as they should be stated. It begins with a short description of "The Industrial City" in clear type, on good paper, facing a bird's eye view of the central section of the city. The next page is devoted to street scenes, which are excellent, and the opposite page to "Facts About Hamilton." Then follow two pages containing small views of Hamilton's industries, statistics, and brief statements regarding raw material, labor, shipping facilities, freight rates, electric power, the home life, distances from American cities; a list of plants of United States parentage; educational facilities, and civic government. All this is told in very few words, with many photographs.

Bonusing Firms.

We now come to a phase of publicity policy which has come prominently into the limelight lately, and on which "Canadian Machinery" has expressed itself strongly editorially. Reference is made to the practice of giving bonuses to firms who guarantee to erect a plant in a city, within a certain period, and to employ a specific number of men. The practice has become so common now that it is almost impossible for a town to secure an industry on its merits. To succeed, a town must be prepared to guarantee the bonds of a concern, or to loan them a sum often as high as from $100,000 to $200,000. The ratepayers, in their anxiety to have a big plant in their midst, having full confidence in the capacity for business of their civic rulers, and after being assured beyond question by the local Press that the scheme is bona fide, vote favorably on the measure, and mortgage their interests for the next ten years, taking a chance on an industry that may be run by a bunch of nincompoops. In some cases, the business fails, and the onus falls on the innocent ratepayers, who must pay through the nose in the form of taxes.

Not only is a loan demanded, but it has become a recognized custom for a new concern to demand a site on which to build the plant, as well as tax exemption for a number of years, together with dirt-cheap water and power.

This system of bonusing is the weapon in the hand of the smaller cities, which is attracting firms from the larger centres. There are cities in Canada to whom it would be ruinous to adopt a system of handing out sites to every industry that came along, and who are not amenable to the custom of lending money.

A splendid system has been adopted by Windsor, Ont., which is similar to that existing in Indianapolis, except that the latter is run by a private corporation. In Windsor, the city secured the best property available at the lowest possible cost, made all necessary improvements, and then offered it to manufacturers at the original cost of $500 an acre. This property has connection with all the railways by a spur line, and is only three blocks from the main thoroughfare. Windsor offers this to manufacturers employing at least twenty-five hands; exemption for ten years from taxes, other than school and local improvement rates, which no city can remit. Free water for ten years, and free light for ten years, beginning from the time that Windsor gets Niagara power. Nothing is said about a loan, and it is plain that the manufacturer must pay for his site.

Few cities are as frank as Windsor, and do not state as a rule what inducements they are prepared to offer in their publicity literature. Like Midland, Ont., they intimate their intention of giving things in the following way:—

"To this end a liberal policy in the way of municipal concessions to prospective manufacturers and industrial concerns has been decided upon by the council." No manufacturer knows what he is able to extract from a city council until he has laid his proposition before them. If it comes to a fight, then things will be going cheap.

Peterborough, Ont., encourages the location of industries, depending upon their size. London, Ont., gives free sites, cash bonuses, and fixed assessment of about 25 per cent. St. Thomas council are offering inducements on certain conditions. Brantford gives a fixed assessment for ten years. Welland offers a free site, a fixed rate of taxation for ten years, and city water at 5 cents per million gallons for manufacturing purposes, which is the cost of pumping. Woodstock, Ont., is prepared to offer free sites, water, power and light at about cost, and fixed assessment. Calgary, Alta., while opposed to the bonusing of incoming manufacturers, provides sites, light, power and water at cost, and gives exemption from taxation on plants and buildings where 25 hands or over are employed.

This policy of encouraging industries by means of bonuses is not confined to Ontario by any means. Much bigger subsidies might be secured in other provinces, were the geographical situation satisfactory. There are many concerns coming to Canada that hold their hands up at the mention of bonuses. They come here in search of a logical location, and that is first and foremost in their consideration. Depend upon it, the town where such firms locate, is a town with unusual advantages.

SETTLERS FOR THE EASTERN PROVINCES.

THE C.P.R. is actively prosecuting its campaign for attracting settlers to the Eastern Provinces, as well as to the Western lands of the Dominion. A small handbook containing lists of improved farms available for settlement in Canada's Eastern Provinces has just been issued. The publication of this handbook is the first step in an active campaign to be undertaken by the company under the direction of Mr. J. S. Dennis, assistant to the President, and head of the Department of Natural Resources, with the object of placing settlers on the vacant areas throughout the Provinces of Ontario, Quebec, New Brunswick, Nova Scotia and Prince Edward Island.

"We are daily receiving inquiries," says one of the officers of the company, "from intending settlers who express a desire to take up farms in the older settled provinces of the Dominion, or who have friends and relatives already living in the East and desire to settle near them, and it is with the object of placing reliable information in the hands of these people that this handbook has been published. The lists of farms contained in the booklet have without exception been obtained through the medium of the several Provincial Governments concerned, and it is the company's desire to co-operate with the Governments of the Eastern Provinces in the placing of settlers on these farms. It is our intention to distribute about five thousand of these booklets throughout Great Britain, and also a large number through our agencies in the United States."

Public Service Cup Co. of Canada, Ltd., incorporated at Ottawa, capital $100,000, to purchase and acquire from the Public Service Cup Co. of New York City, certain patents of invention granted by the Dominion of Canada for cup machines, etc., at Ottawa. Incorporators: James W. Hennessy, Fort Coulonge, William H. Dwyer, etc., Ottawa.

The Shipbuilding Plant of G. T. Davie & Sons, Levis, P.Q.

Staff Article

In this article particular prominence is given to the equipment installed at the Davie Plant, and to the firm's ability to handle large and heavy marine repairs; the S. S. Wabana being a typical example of the latter.

ACROSS the River St. Lawrence from Quebec, a little east of Levis, is a quaint two-storey frame building. The upper storey is a residence, and the lower floor an office. Over the doorway of the latter is a sign which reads: "Patent Slip Office." This refers to an antiquated slip erected seventy-five years ago for doing all kinds of repair work on wood and iron ships up to 150 feet keel. Anchored nearby is the recently launched Canadian Government Hopper Barge No. 1, of 850 tons. The question that naturally arises is, "Where are the shops?" These are at St. Joseph de Levis, several miles eastward, near the Government dry dock. The "patent slip office" is the headquarters for the shipbuilding firm of Geo. T. Davie & Sons, Levis, P.Q.

Importance of the Firm.

Interest has been centred in this firm of late, because of the hopper barge which they are completing for the Government, and of the fact that they have just completed a repair job on the s.s. Wabana, a vessel of 5,000 tons register, which went on the rocks at Fame Point last May. This vessel was 32 days in the repairers' hands, out of which five Sundays must be deducted. In that time 135 plates were handled, 100 of which were badly buckled and broken, and 50 per cent. renewed.

S.S. "Wabana" Repair.

The "Wabana" was on charter by the Dominion Coal Co., Montreal, when she went on the rocks. She was, however, able to come up the river to Montreal, where she discharged her cargo of coal. It was then suggested that the ship be placed in the new Montreal floating dock for repair, but the underwriters sent her back to Quebec.

Surveyors and experts were called in to examine the ship, and tenders were called for her repair.

A New York firm put in a tender, as did Geo. T. Davie & Sons, and the latter were awarded the contract. The steamer was placed in the Levis dry dock for permanent repairs, superintended at the start by Mr. Blackett, chief of the London (Eng.) Salvage Co., and afterwards by Mr. Henry Black, expert engineer

THE OLD SLIP.

and Lloyd's surveyor at the port of New York. The Wabana is quite a new ship, being only 15 months old when she went on the rocks.

It is remarkable that the repairs could be done in such a short time, especially when it is considered that the movement of all the material had to be done by hand. The dock is devoid of any travelling cranes or even capstans, and the pumps of the dock are so obsolete that it takes 15 hours to pump the water out, in comparison with 3 hours in other Atlantic dry docks.

Plant Features.

From a glance at the illustrations and a study of the following description of the shipbuilding works located alongside the dry dock, it will be seen at once that the plant is considerably hampered by the need of proper facilities for handling the work between the shops and the vessel. The derricks shown in the illustration seem hardly capable of handling work required for anything like the Wabana contract.

In the shops there is a powerful air compressor, with the necessary receivers and permanent pipe line to dock bottom; also a complete up-to-date outfit of drills, riveters, rammers and other necessary air tools for expeditiously handling repairs to steel or iron steamers. There is a portable compressor which can be moved quickly to deal

DRY DOCK AT LEVIS, QUE., SHOWING VESSELS WINTERING.

with repairs to vessels at the different docks and wharves, while loading or discharging cargo.

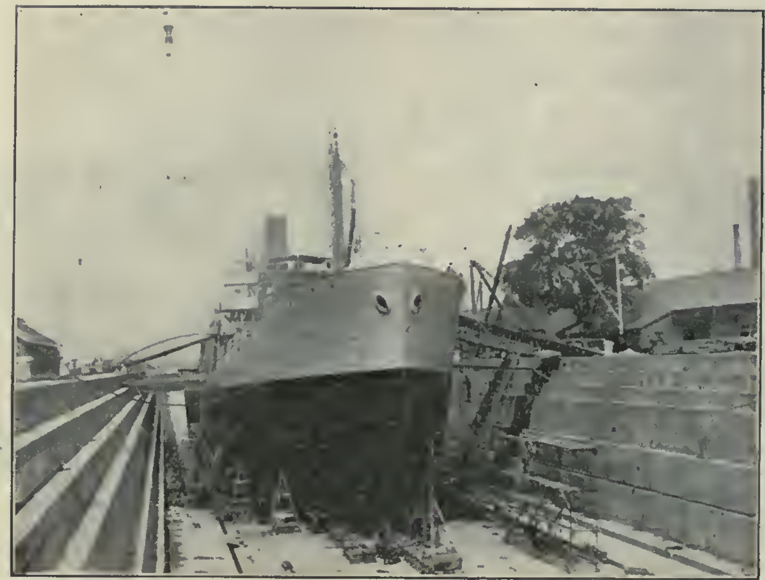
The plant contains a complete outfit of differential pulleys, hydraulic blocks for tail shaft and propeller work, and a floating derrick capable of lifting and moving loads of from fifteen to twenty tons. The shops, vessels and docks are lighted with electricity. There is also telephone communication between the main office at Levis and the works and docks, enabling touch to be kept with all departments, thus securing prompt despatch on all repair and other jobs.

The firm has purchased from A. W. Smith & Son, Limited, Glasgow, Scotland, and installed in their shops, a set of rolls, capable of rolling plates up to 26 ft. 6 in. long, and of any width and thickness in use or likely to be used in steel shipbuilding; one cam and lever wide gap punch, with powerful cranes to handle plates 30 ft. long, 7 ft. wide and 1 ft. 6 in. thick. They have also purchased from the same firm a combined horizontal beam bender punch and shaper, capable of curving beams of any section used in shipbuilding, and forming channels, tees, etc., to any reasonable angle, thus eliminating expensive angle smith work. There is also a Cameron, Manchester, cam and lever punch, shear and angle cutter, capable of dealing with plates up to 1¼ inches thick, and cutting angles 7 x 7 inches.

Among the equipment there are also a double-ended punch and shear, made by Barry's, Sowerby Bridge, England, which will punch up to 1 inch in thickness, and a portable punch for casing work on ship decks; a heavy set of Cameron rolls for plates 16 ft. long; a plate planing machine, by the same maker; a Shank's keel bender; a Barry horizontal punch and beam bender, and two Hetherington, Manchester, patent swing countersinking machines.

The plate furnace is capable of dealing with the largest plates in general use. The angle furnace is up-to-date, with a large bending block area, enabling stern bars to be curved up to 70 ft. long. There is a side lever cold saw, for cutting butts off garboard plates, with all the necessary gear for quick manipulation. In the engineering department there is a large multiple drill for stern frame work, with other drills for lighter work. In addition to the foregoing, there are shaper and scarphing machines, lathes, planers, and other machine tools generally associated with marine and general engineering plants.

In the blacksmith's department there is a Shank's steam hammer with 24 in. lift, two rivet making machines, and the usual outfit of a first-class forge. Material carried in stock, including plates, angles, bulb angles, channels, tees, rounds, half-rounds, squares, etc., is very large. Keel and stern bars, chequered plates, and every section that the last twenty years of shipbuilding has made necessary, are kept on hand. Large quantities of rivets of suitable sizes, all of which are certified by Lloyd's Register of British and Foreign Shipping, Bureau Veritas, or other classification, are also kept in stock.



S. S. "WABANA" IN DRY DOCK AT LEVIS, QUE.

W. H. ALLEN, SON & CO., TESTING PLANT.

W. H. ALLEN, SON & Co., of Bedford, England, who do a large business in Canada in high speed engines, centrifugal pumps, etc., have remarkably complete arrangements made for testing the product of their works. There are five Babcock and Wilcox land type boilers with superheaters, one having a full load capacity of 20,000 lb. an hour, and four of 6,000 lb. an hour each. The large boiler is fitted with a special type of superheater damper, by which the amount of superheat can be varied. The draught is induced, cold air being driven upwards through the throat of the chimney by a steam turbine-driven fan. All the boilers are hand-fired with Welsh steam coal, experience having proved this method the most satisfactory, when rapid fluctuations in load have to be dealt with.

In the testing department are beds for the temporary fixing of steam engines and dynamos, and steam and exhaust mains are carried along the entire length. For testing centrifugal pumps, a covered-in tank with a capacity of about 28,000 gallons has been provided with four Venturi meters and gauges. The equipment for the testing of centrifugal fans includes a special air trunk and differential draught gauge.

LABOR DISPUTES IN JULY.

ACCORDING to the record maintained by the Department of Labor, industrial conditions showed an improvement with regard to labor disputes during July. There were 24 in existence as compared with 27 during the previous month.

A still greater improvement is seen by the comparison made with the corresponding period of last year, when there were 46 strikes and lock-outs existing in the Dominion.

During July, 1913 about 152 firms and 8,000 employes were involved in strikes and lock-outs as compared with 450 firms and 11,957 employes affected by trade disputes during the previous month. There was a slight increase in the loss of time to employees, about 188,000 working days being lost, as compared with approximately 181,000 during June.

It may be mentioned that during July, 1912, upwards of 270,000 working days were lost from this cause.

Two disputes of importance occurred during July, while of those that were in existence previous to this month, the most important as affecting industrial conditions, were those of coal miners on Vancouver Island and saw-mill hands at St. John, N.B. These two disputes together accounted for a loss of upwards of 130,000 working days.

T. P. O'Connor, sales manager of the steel and iron department of the Steel Co. of Canada, for several years, has resigned.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

DRILL JIG DESIGNING.

By A. L. Monrad.

TOOLmakers and designers often overlook the most important parts

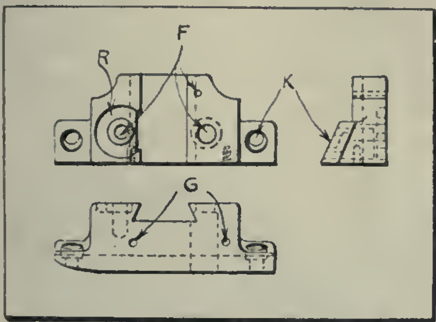


FIG. 1.—DRILL JIG DESIGNING.

in designing and making drill jigs for the production of interchangeable parts from an economic viewpoint, and yet

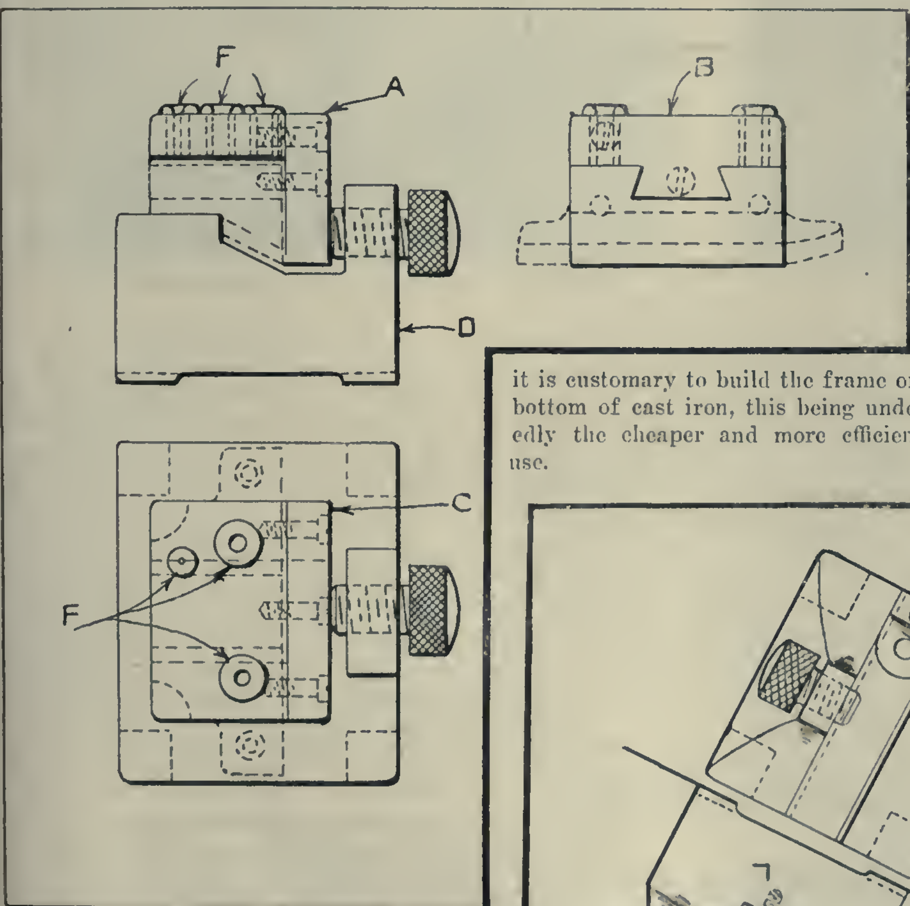


FIG. 2. DRILL JIG DESIGNING.

if someone had posted them in proper time, the result would have been a marked increase of accuracy and efficiency of the jig.

A good designer keeps constantly in mind: That the maximum amount of work must be produced in the shortest operating time, with the least amount of labor, and at the lowest cost. Achievement of the foregoing is very seldom attained, even if the designer has the power right in his own hand. Many still hang to the old ideas that a jig ought to have a handle, and a large base area for legs, both of which increase the weight of the jig, and make it harder to handle, besides being very unsafe practice should the drill suddenly "take hold."

Much has been going on among jig designers lately as to using cast iron legs instead of hardened tool steel legs. From an economic standpoint, cast iron legs wear as long as tool steel on small light jigs, and even on larger jigs, if proportional bearing surface has been provided, it outwears the jig in many cases. Where cast iron legs are used, it is customary to build the frame or the bottom of cast iron, this being undoubtedly the cheaper and more efficient to use.

Drill jig bushings are as a rule made of tool steel hardened in bran or salt water. They are then ground outside and inside. The hole is lapped to a turn-

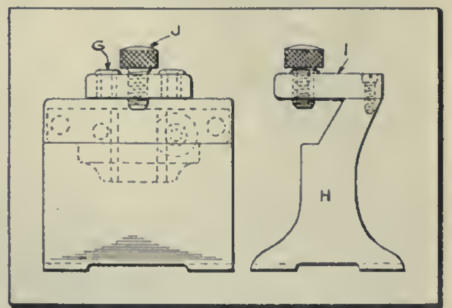


FIG. 3. DRILL JIG DESIGNING.

ing fit of the drill to be used. The length of bushing bearing should equal that of head of spiral of drill. The upper part of bushing hole should increase its diameter to prevent the drill binding on account of excessive bearing. The entrance hole in bushing should be considerably rounded for an easy entering of the drill, and the bushing should also have large diameter of head to prevent mutilating the jig body or lid. The outlet of bushing hole should also be rounded so as to shed the chips. A groove is cut in under the head of the bushing so that when grinding the outside diameter, the wheel will not have to corner. The lower end of the bushing diameter should be a little tapered to drive in easy.

In the clamping device of a drill jig do away as much as possible with duplicate pieces or connections, especially

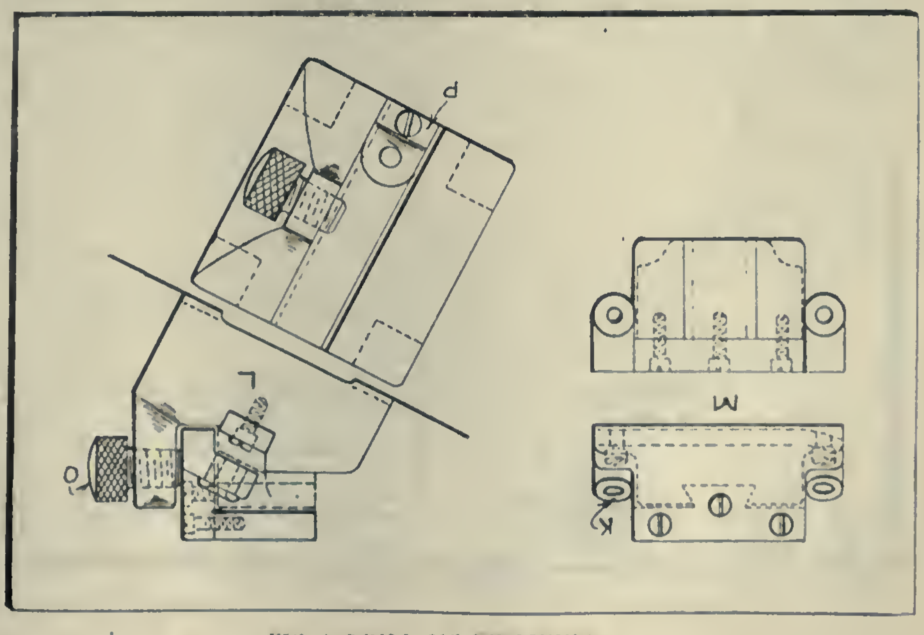


FIG. 4. DRILL JIG DESIGNING.

where one of these will accomplish the same result, such as one screw or cam motion. A drill jig lid generally hangs on a taper pin, having a driving fit on each side of frame, and a turning fit on the lid, in order that the hinge may be compensated for and the resulting inaccuracy due to the lost motion in the lid be prevented. An oil groove is milled in the middle of taper pin for lubricating the hinge after the pin is driven in, and screw for locking purposes in a jig should be so located that it will not tilt the work to one side or the other.

It is very essential that the screw pressure should be in a direct line so as to have equal metal on each side of the centre line to prevent tilting and provide thrust in such manner that it will be resisted by solid metal. The designer and operator very often underestimate the power of a screw, with the result that the work springs and if drilled under these circumstances results in spoiling the accuracy of operation.

There is described and illustrated in Fig. 1, a very simple jig design, with screw device for clamping, to drill seven, and counterbore two holes. This is known as the block system, because all the jigs are placed in a cast iron block during drilling operation. The model has been machined all over and is interchangeable. The tap holes in model are first drilled with jig Fig. 2. The drill jig proper (A) is made of second grade tool steel, hardened. The dove-tailed part (B) has been made a sliding fit in the model, and is held to a stop plate (C) by three cap screws. Two stop pins are provided between the work and stop plate (C), to locate the work properly, and at such a height as to keep all chips away from the work.

The jig is now placed on the cast iron block (D) which has four legs planed on the bottom. By turning the screw (E) the work with the jig is held firmly in position while drilling the three holes (F). The two holes (G) on the side of the model were drilled as shown in Fig. 3. This is a solid jig, made of cast iron, with a steel bushing plate (I) on top held with two screws. By having the work slide up to a stop pin and bottom in the angle of drill jig at same time turning the knurled finger screw (J), it is secured in position and is ready for the drilling operation. The two end holes (K) are drilled as shown in Fig. 4. This also has the dove-tailed slot in the

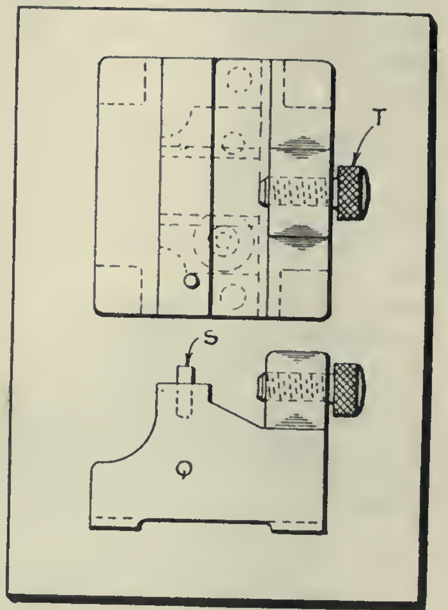


FIG. 5. DRILL JIG DESIGNING.

model, also two ears extended, one on each side on the same angle as the model. A cast iron block (L) is made so that when the jig (M) is in position, the bushing stands at right angles with the drill press table. A turn of the knurled screw (O) brings the jig into a secure position. A curved steel piece (P) is located on the end of jig with a screw, and acts as a seat for the curve in the model when drilling, also as the stop with the screw extended above.

Fig. 5 is a cast iron block jig (Q) for holding the work while hollow milling hole (R). By placing the work against the stop pin (S) and turning the knurled screw (T), the work is secured in position while hollowmilling.

Fig. 6 is very similar to Fig. 4, only the groove in the centre is nearer in order to accommodate the work, and without the jig for counterboring the head holes (K).

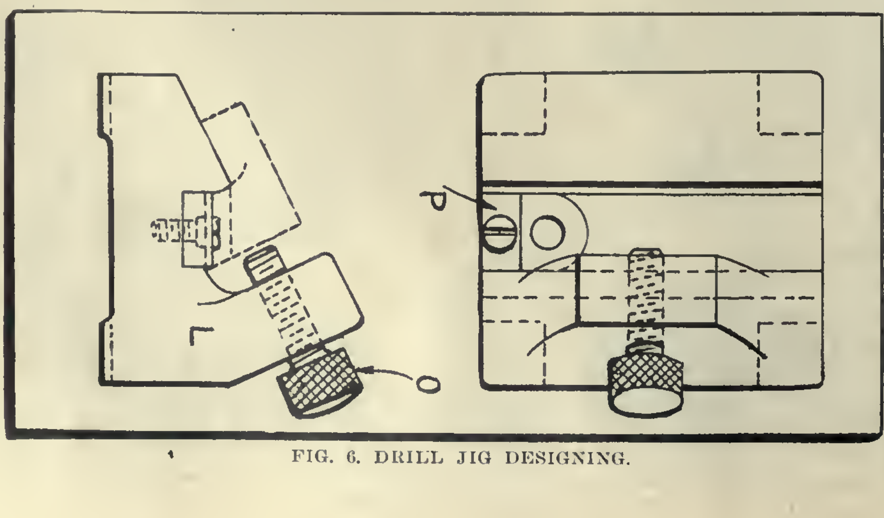


FIG. 6. DRILL JIG DESIGNING.

CIVIC PUBLICITY.

By H. M. Marsh,

In these days of specialists and applied effort, it has been demonstrated that those who want to keep in the van of progress must adopt the most improved methods. Most municipalities have what is termed an Industrial Committee composed of representatives of the City Council and prominent business men whose duty it is to entertain visitors seeking information regarding industrial possibilities. However "what is everybody's business is nobody's business," and as all of these men are generally very busy men, and can scarcely afford to give any time from their own business, the imparting of information to inquiries from the United States or other Canadian Cities is often improperly attended to. This was the condition of affairs in Hamilton until about two and a half years ago, when it was decided to appoint an official who could devote all his time to properly setting forth the advantages of Hamilton, and who would have under his particular charge the task of inducing industries to locate here.

That the appointing of an Industrial Commissioner has been justified has been demonstrated by the results shown during the last two years. The Industrial Department has been instrumental in securing for Hamilton some thirty new industries representing an investment of over six million dollars. Among the largest industrial acquisitions may be mentioned: The Oliver Chilled Plow Works, of South Bend, Ind.; National Fireproofing Co., of Pittsburg, Pa.; Canada Steel Co.; Standard Underground Cable Co.; Boston Insulated Wire Co., Boston; Schacht Motor Car Co., Cincinnati; Grasselli Chemical Co., Cleveland; Dominion Steel Castings, Ltd.; National Steel Car Co. The bulk of the capital is of United States origin, so that Hamilton to-day occupies the proud position of having more American capital invested in industrial pursuits than any other Canadian city.

The International Harvester Co. which closed its plant a couple of weeks ago, announced on August 18, that it would resume operations on September 2, with a staff of about 1,500 men. The Oliver chilled Plow Works, which has also been shut down, is preparing to open up again about the same time. This is very welcome news to an army of idle workingmen in Hamilton.

CANADIAN MANUFACTURERS CONVENTION.

PLANS are now practically complete for the big excursion which the Canadian Manufacturers' Association will run to Halifax next month in connection with the Annual Convention of that organization which will this year be held in the Nova Scotian city. It is expected that some fifty Montrealers, many of them accompanied by wives and families, will make the trip, while altogether there will be some two hundred delegates from Quebec and Ontario. A number of Westerners will also attend. The itinerary has not yet been completed, but it has been decided to visit St. Andrews on the way down and later to proceed as far as Amherst and New Glasgow.

Convention Features.

The convention will last for three days, September 16, 17, and 18, and the excursion will probably leave Montreal on the morning of September 14. Reports from Halifax state that great preparations are being made to entertain the visitors. The civic reception and a trip around the city and harbor will figure prominently. The local council of women is making arrangements to entertain the lady visitors while the men are attending business sessions. A motor trip around the harbor and a theatre party are two items of the programme.

The annual banquet will take place on the night of September 18. The Premier has been invited to attend, and has stated that while he can as yet give no definite promise he anticipates being present. Sir Wilfrid Laurier has also been invited, and, if he cannot be present in person, it is likely that he will send a representative, so that both political parties will be officially represented.

A number of interesting questions, chiefly in connection with transportation problems and tariff difficulties, will come up for discussion.

CANADA IRON CORPORATION.

APPLICATION was made to the courts on August 21 by the Canada Iron Corporation for the appointment of a receiver, under whose direction the affairs of the corporation will be conducted pending a reconstruction of its finances. The application was granted, and F. F. Whyte, of New York, was named as the receiver.

The decision to apply for a receiver was reached at a meeting of the Board of Directors last week, and it was stated on behalf of the directors that since the expiration of the bounties reduction in profits had seriously hampered operations. The directors have decided that the only course open to them is to reduce their fixed charges by a reorganization of their finances, and the receivership is preliminary to a reorganization plan which is now being formulated.

The company is what is known as a close corporation, its stock not being listed on any exchange. Its 6 per cent. bonds, however, have been listed in London since 1909. The company has mines at Eganville and Bessemer, Ont.; Bathurst, N.B., and Torbrook, N.S. Its furnaces are situated at Midland, Ont.; Radnor and Drummondville, Que.; and its foundries are at Fort William, Hamilton, St. Thomas and Midland, Ont.; Montreal, Three Rivers and Londonderry, Que.

The head office of the concern is in Montreal, and the directors are: Thomas J. Drummond, Montreal, president; George E. Drummond, Montreal, vice-president; Edgar McDougall, Montreal, vice-president and general manager; A. E. Dyment, Toronto; H. Cockshutt, Brantford. There is also a directorial committee in London.

GEAR CUTTING ATTACHMENT FOR THE LATHE.

By J. H. W.

THE gear cutting attachment here shown was designed and manufactured by John Fee, who has a well appointed machine shop at 107 Lagauchetiere Street W., Montreal. While embodying no new principle, the device is a good example of what such an attachment should be. It is inexpensive to make and combines simplicity with efficiency.

Referring to the cuts, Fig. 1 shows the attachment assembled on the lathe, with a completed gear wheel in position on the mandrel. The indexing head (A), taken from a milling machine, is carried by the cross slide (B) seen in Fig. 2. The latter is elevated by the square threaded screw (C). Chatter of the work is prevented by the thrust screw (D), the point of which is brought up against the back of the gear blank, and there locked by the lever nut (E). The bracket which forms a nut for this screw (D) is, of course, adjustable vertically to suit various diameters of gear blanks.

The base of the apparatus is clamped to the lathe bed in the manner shown in the cuts, and the upper part is traversed across by a screw operated by the handwheel (F). The gear cutter is carried on an arbor between the lathe centres in the usual manner.

Since these photographs were taken, a dividing head has been fitted at the end of the elevating screw (C), enabling the depth of cut to be determined without direct measurement.

A gear 46 inches in diameter can be cut on this attachment, which has paid for itself many times over. It would, of course, be a comparatively simple matter to fit such a device with a power feed if thought desirable.

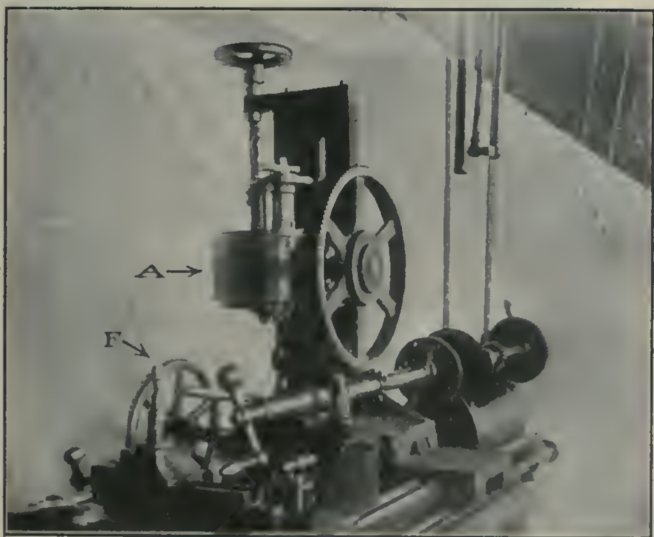


FIG. 1. GEAR CUTTING ATTACHMENT FOR LATHE.

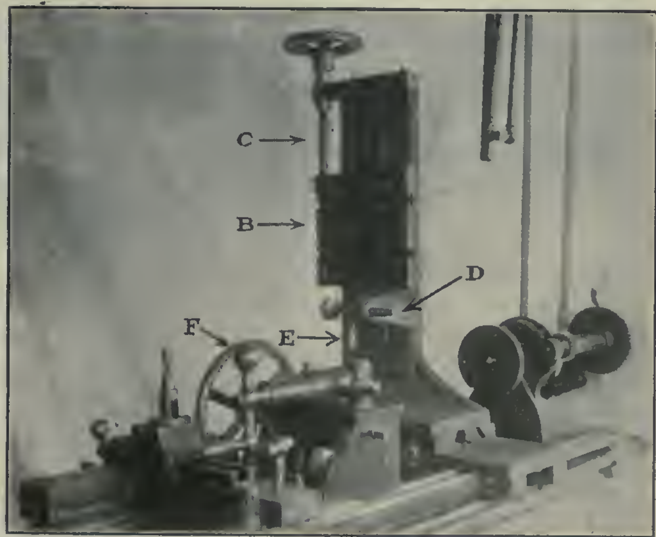


FIG. 2. GEAR CUTTING ATTACHMENT FOR LATHE.

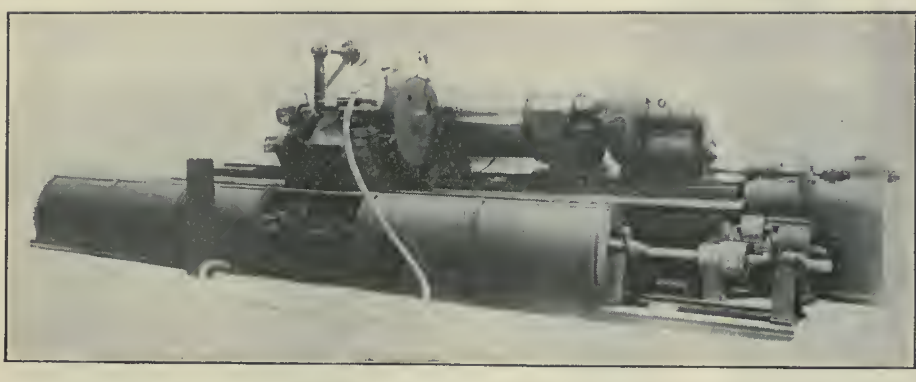
DEVELOPMENTS IN MACHINERY

A Record of New and Improved Machinery Tending Towards Higher Quality and Economical Production in the Machine Shop, Blacksmith Shop or Planing Mill.

A NEW ROLL GRINDER.

THE grinding machine, here illustrated, embodies the Landis Tool Co.'s distinguishing principle of traversing the grinding wheel carriage, which is a fixed weight. The advantages of this principle are:—

1.—Unvaried duty imposed at all times upon the carriage driving mechanism, insuring accuracy of traveling distance between points of reversal.



LANDIS ROLL GRINDING MACHINE.

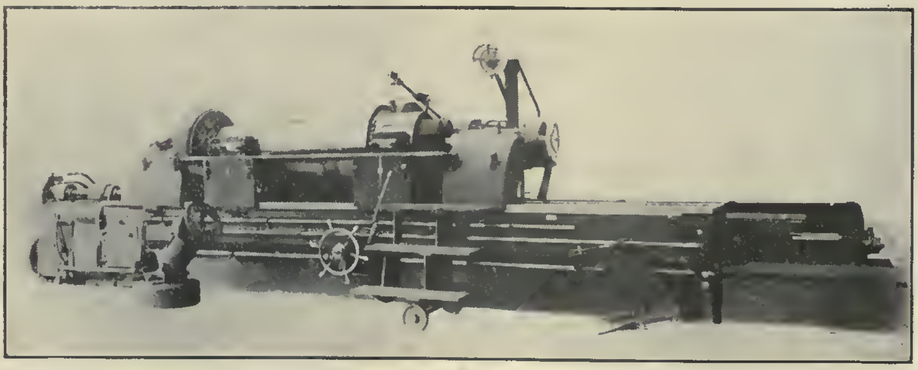
2.—Uniform and positive lubrication of the ways.

3.—A rigid and stationary foundation for the work, whatever its length or weight.

4.—No over-hanging of the work table, it being supported throughout its entire length by the main column of the machine to which it is firmly clamped, thus avoiding vibration, a feature which is very essential to rapid and accurate grinding.

A Manufacturing Product.

It is strictly a manufacturing machine, and while principally intended for grinding hardened steel and chilled rolls, is also especially adapted for finishing a great variety of other cylindrical work such as large shafts, pistons, corliss valves, plungers, torpedo tubes, laundry and printing press rolls, etc.



LANDIS ROLL GRINDING MACHINE.

The machine is self-contained in design, being entirely without overhead countershaft, although, when it is desired to drive from a line shaft, an auxiliary shaft with tight and loose pulleys, and a cone pulley for belting to the machine is required. This plan of construction makes it convenient to place the machine under a crane for lifting the work in and out, and offers no overhead obstruction to the passage of the crane.

For electric drive the motor is mounted on an extension of the main drive base, and can be connected direct to the drive shaft or belted as desired. The machine can also be driven with the motor placed on the ceiling or wall, in which case the base on the machine is not needed. The main drive is located in the rear of the machine, and consists of a shaft extending the full length, from which the different mechanisms are driven independently through belts. It is protected the entire length with a sheet metal guard.

The grinding wheel driving pulley traverses with the wheel carriage and is trunnioned in an independent carriage which travels on a track formed on the base of the main drive. The pulley is driven by rollers in its hub, which engage step grooves in the main drive shaft, and in travelling this makes a practically frictionless driving connection. The grinding wheel belt passes over idler pulleys, which are so arranged that the belt length does not change as the wheel head is moved on the cross slide. One of the idler pulleys automatically takes up any stretch in the belt, and at the same time keeps the latter under a uniform tension.

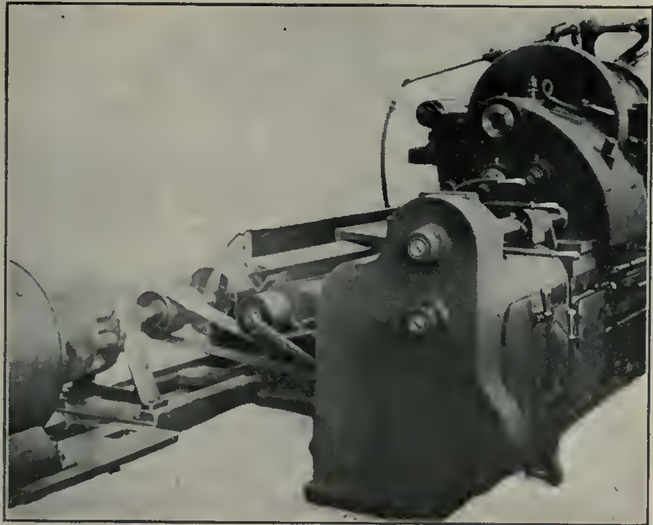
The work and traverse speeds are varied and operated independently of each other, an important factor in commercial grinding, as it gives the necessary traverse feed for any work speed. For grinding taper, the table swivels and has two scales, graduated in degrees and inches per foot.

The headstock is of heavy construction throughout and the work is driven by powerful gearing. The speed changes are made by an arrangement of levers at the front of machine. The footstock spindle is operated by a hand wheel which is geared to the screw, so that the centre can be easily run into the work with the heaviest piece in place that the machine will take.

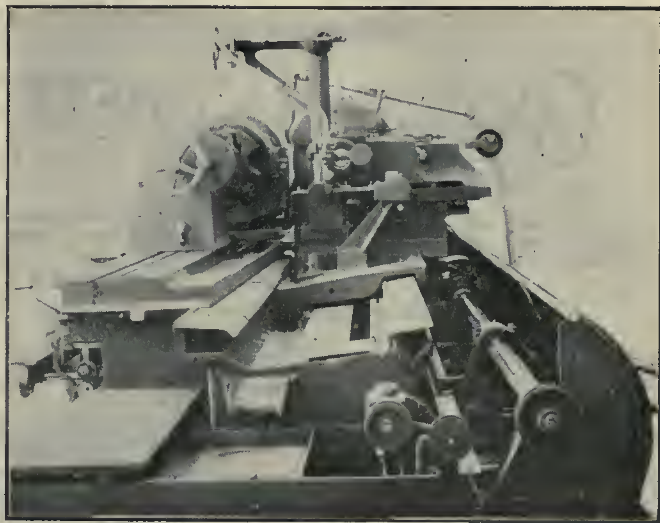
The grinding wheel head is massive and rigid, and is mounted on a vee and flat guide, of ample proportions to ensure a smooth and positive action when feeding for the lightest cut on the work. The spindle is made of special heat-treated steel and runs in bronze bearings which are adjusted in tapers for taking up wear. The bearings have a ball and socket connection with the base, which makes them easy to keep in line with the spindle.

The feeding of the grinding wheel to the work can be done either automatically or by hand. There is also a rapid power feed for moving the wheel back out of the way when changing the work, and also for bringing it forward to the grinding position. This is a valuable feature, as it saves considerable time as well as making the operating of the wheel easy and convenient. It is entirely independent from the hand and automatic feed, and is operated by a lever and simple arrangement of clutches. The automatic cross feed to the grinding wheel operates at each reversal of the wheel carriage, and can be set for cuts to reduce the diameter of the work from .00025 in. to .012 in.

The grinding wheel truing fixtures are three in number—one mounted permanently on the footstock, where it is in a convenient position for dressing the wheel when grinding necks of the rolls; another on one of the bearings, which carries the roll by the necks when grinding its face; and a third fixture for forming or rounding the corners of the wheel for grinding the fillets of the necks. This last is attached to the table of the machine.



LANDIS ROLL GRINDING MACHINE.



LANDIS ROLL GRINDING MACHINE.

The bearings for carrying rolls by their necks when grinding the body have three point bearings, which are adjustable for the variation in the size of the necks by wear and regrinding. They can be quickly removed and replaced with others for the different sizes of rolls. For grinding concave special bearings are required. These have vertical adjustments for tipping the roll to an angular position, with one end above and the other below the horizontal centre line of the wheel which results in a concave form being ground. The up and down settings are indicated by graduated scales, and are made by screw adjustments. These bearings can also be used for grinding straight rolls, and the arrangement of the bearing pads is the same as those described above. The concaving outfit includes a universal driver for the work.

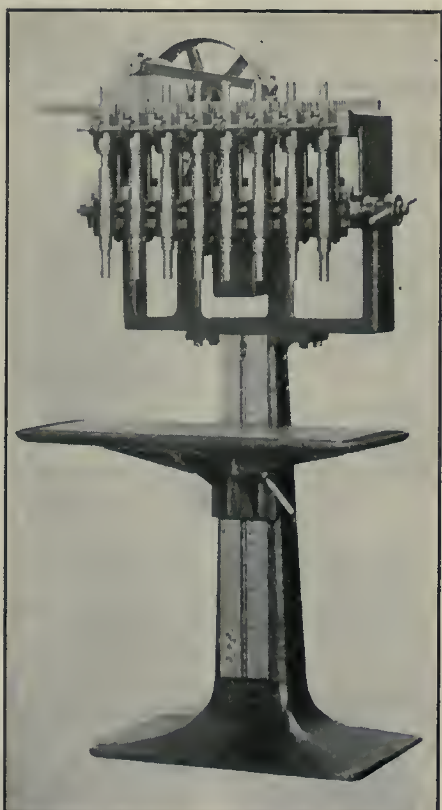
This machine is a recent product of the Landis Tool Company, Waynesboro, Pa., and is made in three sizes. The smallest size grinds work 30 x 120 inches, the intermediate 20 x 144 inches, and the largest size 30 x 168 inches.

G.T.R. SHOPS, MONTREAL.

NOTICES have been posted in the locomotive and car shops of the G.T.R. at Point St. Charles, Montreal, instructing the men that working hours will be reduced from fifty-five to fifty hours per week until further notice. This, it is expected, will mean a complete closing down of the works on Saturdays, as the men work ten hours a day. Recently the C.P.R. announced a similar reduction in time at the Angus shops.

ADJUSTABLE MULTIPLE SPINDLE OSCILLATING VALVE GRINDER.

THE Adjustable Multiple Spindle Oscillating Valve Grinder illustrated herewith was brought out by the Foote-Burt Co., Cleveland, Ohio, and designed by them for use in the manufacture of automobile engines, as a complete set of valves can be seated in less time than it ordinarily takes to seat one by the hand method.



ADJUSTABLE MULTIPLE SPINDLE OSCILLATING VALVE GRINDER.

The spindles reverse every one and a quarter turns, and a cam is provided which raises and lowers them every twenty revolutions to allow the grinding compound to enter the valve seat. Any number of spindles can be furnished, from two to twelve, depending on the type of cylinder, and they are adjustable up to a minimum centre distance of two inches.

The spindles are arranged with a ball bearing thrust on each end of the bearing and have a travel of two and a quarter inches. The spindle noses are equipped with No. 1 Morse taper. The table is adjustable up and down to take care of different heights of cylinders.

The machine, as will be noted, therefore, is flexible, and any type of cylinder can be handled to advantage.

LARGE CONTRACTS PENDING.

SOME very large contracts are about to be awarded by the Government. Tenders for the Toronto harbor works, to cost half a million dollars, and each requiring a deposit of $300,000, were sent in on August 23.

Proposals for the second contract on the Welland Canal, estimated at $4,000,000, will be received on August 27, and for the first section of the Severn River end of the Trent Canal August 25.

Owing to the magnitude of the works, and the large deposits required, only large firms will be in a position to tender on the original contracts.

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Vol. X. AUGUST 28, 1913 No. 9

PRINCIPAL CONTENTS.

WHY AN INDUSTRIAL COMMISSIONER PAYS.

A TORONTO weekly newspaper has drawn attention to and mourned over the fact that the James Langmuir Paint Company has decided to remove its plant from the Queen City to Oakville, Ont., and explains that the reason of the move is because Oakville ratepayers promised to give the firm an exemption for a number of years. That is quite correct, for the James Langmuir Paint Company has purchased several acres in Oakville, and the move will shortly take place.

Why, asks this paper, does James Langmuir, who is a very rich man, have to leave Toronto to go to Oakville to avoid paying taxes? It suggests that legislation be passed to prevent municipalities mortgaging the property of their ratepayers in order to induce industries to move.

The suggestion is a good one, and has been advocated by "Canadian Machinery," but the question why James Langmuir should move to Oakville, is foolish. It is a business proposition. Probably this paint company, like many others in Toronto, has expanded to bursting point, and not being able to expand any further, not being offered any inducements to stay in Toronto, finding its taxes an intolerable and unnecessary burden, has turned its eyes elsewhere. Oakville, like many other suburban towns, has beckoned it, promising exemption from taxation, and James Langmuir and his big paint concern have answered the call. Who can blame him?

The point we wish to draw attention to is that the call of Oakville was louder and sweeter than that of Toronto, and the Langmuir Paint Co. is only one of many concerns who have packed up and moved into the country. There have been so many exoduses from Toronto lately, one has been compelled to ask the question: Is there no Industrial Department there, no Commissioner of Industries, no Board of Trade? There IS a Board of Trade, but no Commissioner, or a more determined attempt would certainly have been made to keep these prosperous and wealthy industries within the city limits.

The names of at least four large Toronto manufacturing concerns occur to us at this moment, who have moved into the country from Toronto within the last few weeks. First, there is the firm of Rice, Knight, Limited, makers of lighting fixtures, who ran away to Goderich, there to build a large new factory. A firm manufacturing a similar line is moving to Lindsay, Ont., and will have a new plant built by Christmas. Then there is the James Langmuir Paint Co., and fourthly, Watsons, Ltd., makers of wire screens, who have been granted a bonus of $20,000 by Bradford, Ont., and will remove their plant as soon as convenient.

The mention of these four names recalls many other instances. Think of the Canadian Boving Co., who are building at Lindsay, Ont., The Pease Furnace Co., who moved their plant to Brampton, Ont., of the Hough Lithographing Co., Ltd., and the J. W. Hewetson Co., Ltd., shoe manufacturers, who have already purchased land for new plants in Brampton; of the Massey-Harris Co., who are building in the same town, of the Positive Clutch and Pulley Co., who moved their plant out to Aurora, Ont. By letting the mind wander through Weston, Ont., and other suburbs, many other startling examples will readily occur.

The time has arrived when the great Metropolis of Ontario, to which all business was supposed to flow, should adopt the slogan "Wake Up Toronto." Are the ratepayers of that city aware of the manner in which this important phase of civic work is being neglected? They see it daily recorded in the newspapers, but it means nothing to them. So blind are they, if a proposal to engage a man to save the industries were brought up, it would be voted down as a waste of money. How different to the attitude of the people of Bradford who, after stealing the plant of Watson's, Ltd., two weeks ago, held a torch-light procession to celebrate the achievement

The plea will be made that Toronto, unlike its pigmy neighbors, is not able to grant exemptions, free sites, loans and such like. Perhaps this is true, but she has other inducements to offer that no other city in Ontario can approach, and by inaugurating a publicity department, ways and means might be found by which these industries, which make the wealth of the city, may be saved.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

	Mont'l.	Tor'to.
Grey Forge, Pittsburg.	.....	14 25
Lake Superior, charcoal, Chicago	.....	14 50
Middlesboro, No. 3....	20 00	21 50
Summerlee, No. 2	22 00	26 50
Carron, special	22 50	.....
Carron, soft	22 50	.....
Cleveland, No. 1......	19 25	22 00
Clarence, No. 3	20 00	21 00
Jarrow	.....	23 50
Glengarnock	.....	26 00
Michigan charcoal iron	27 00	.....
Ferro Nickel pig iron (Soo)	.....	25 00
Staveley, No. 1	20 00	22 50
„ No. 3	20 00	22 00

BILLETS.

	Per Gross Ton.
Bessemer billets, Pittsburgh ...	$27 00
Open hearth billets, Pittsburgh.	27 00
Forging billets, Pittsburgh	34 00
Wire rods, Pittsburgh	28 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto..	2.10
Steel bars, f.o.b., Toronto........	2.20
Common bar iron, f.o.b., Montreal.	2.15
Steel bars, f.o.b., Montreal......	2.25
Bessemer rails, heavy, at mill....	1.25
Iron bars, Pittsburgh	1.60
Steel bars, Pittsburgh, future	1.40
Tank plates, Pittsburgh, future...	1.45
Beams, Pittsburgh, future	1.45
Angles, Pittsburgh, future	1.45
Steel hoops, Pittsburgh	1.50

F.O.B., Toronto Warehouse.	Cents.
Steel bars	2.30
Small shapes	2.40

Warehouse, Freight and Duty to Pay.

	Cents.
Steel bars	1.85
Structural shapes	1.95
Plates	1.95

Freight, Pittsburgh to Toronto.

18 cents carload; 21 cents less carload.

BOILER PLATES.

	Mont'l.	Tor'to.
Plates, ¼ to ½ in., 100 lbs.	$2.35	$2.25
Heads, per 100 lbs.........	2.65	2.65
Tank plates, 3-16 in.	2.60	2.60
Tubes, per 100 ft., 1 inch	9.50	8.50
" " 1¼ in.	9.50	8.50
" " 1½ "	9.50	9.00
" " 1¾ "	9.50	9.00
" " 2 "	8.75	8.75
" " 2½ "	11.15	11.50
" " 3 "	12.10	12.00
" " 3½ "	14.15	14.50
" " 4 "	18.00	18.00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Stove bolts	80 & 7½
Machine bolts, ⅜ and less	65 & 5
Machine bolts, 7-16.......	57½
Blank bolts	57½
Bolt ends	57½
Machine screws, iron, brass	35 p c.
Nuts, square, all sizes.....	4c per lb off
Nuts, Hexagon, all sizes..	4¼ per lb off
Fillister head	25 per cent.
Iron rivets	60, 10 p c off
Wood screws, flathead, bright	85, 10, 7½ p c off
Wood screws, flathead, brass	75, 10, 7½ p c off
Wood screws, flathead bronze	70, 10, 7½ p c off

National-Acme "Milled Products."

Sq. & Hex Head Cap Screws	65 & 10%
Sq. & Hex Head Cay Screws	65 & 10%
Rd. & Fil. Head Cap Screws	45-10-10%
Flat & But. Head Cap Screws	40-10-10%
Finished Nuts up to 1 in. ..	75%
Finished Nuts over 1 in. ..	72%
Semi-Fin. Nuts, up to 1 in...	75%
Semi-Fin. Nuts over 1 in.....	72%
Studs....	65%

Discounts f.o.b., Montreal.

WROUGHT IRON PIPE.

The following are Toronto jobbers' discounts on pipe in effect from April 21, 1913:

Standard	Buttweld Black	Buttweld Gal.	Lapweld Black	Lapweld Gal.
¼ ⅜ in.	62	47	....	....
½ in.	68	58	....	....
¾ to 1½	71½	61½	68½	58½
2 in.	71½	61½	68½	58½
2½ to 4 in. ..	71½	61½	70½	60½
4½ to 6 in.	....	....	71½	61½
7, 8, 10 in.	....	....	66	54

X Strong P. E.

¼, ⅜, ½in. ..	56½	46½	....	....
¾ to 1½ in. ..	67½	57½	....	....
2 to 3 in.	68½	58½	....	....
2½ to 4 in. ..	....	....	65	55
4½ to 6 in. ..	....	....	64	56
7 to 8 in.	....	....	55	45

XX Strong P. E.

½ to 2 in.	43	33	....	....
2½ to 4 in. ..	....	....	43	33

PRICES OF WROUGHT IRON PIPE.

Standard. Nom. Diam.	Price. per ft.	Extra Strong. Sizes Ins.	Price per ft.	D. Ex. Strong. Size Ins.	Price per ft.
⅛in	$ .05½	⅛in	$ .12	½	$ .32
¼in	.06	¼in	.07½	¾	.35
⅜in	.06	⅜in	.07½	1	.37
½in	.08½	½in	.11	1¼	.52½
¾in	.11½	¾in	.15	1½	.65
1 in	.17½	1 in	.22	2	.91
1¼in	.23½	1¼in	.30	2½	1.37
1½in	.27½	1½in	.36½	3	1.86
2 in	.37	2 in	.50½	3½	2.30
2½in	.58½	2½in	.77	4	2.76
3 in	.76½	3 in	1.03	4½	3.26
3½in	.92	3½in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4½in	1.27	4½in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.86	...	.....
7 in	2.38	7 in	3.81	...	.....
8 in	2.50	8 in	4.34	...	.....
8 in	2.88	9 in	4.90	...	.....
9 in	3.45	10 in	5.48	...	.....
10 in	3.20	....	......	...	.....
10 in	3.50	....	......	...	.....
10 in	4.12	....	......	...	.....

IRON PIPE FITTINGS.

Canadian malleable, 40 per cent.; cast iron, 65; standard bushings, 70; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 75; malleable, lipped unions, 65.

COKE AND COAL.

Solvay Foundry Coke	5.95
Connellsville Foundry Coke	5.45
Yough, Steam Lump Coal	3.93
Penn. Steam Lump Coal	3.63
Best Slack	2.95

All net ton f.o.b. Toronto.

OLD MATERIAL.

Dealers' Buying Prices.	Mont'l.	Tor'to.
Copper, light	$10 50	$11 50
Copper, crucible	12 50	14 50
Copper, uncr'bled, heavy	12 00	12 50
Copper wire, uncrc'bled	12 00	12 50
No. 1 machine compos'n	10 50	11 50
No. 1 comps'n turnings	9 50	9 50
No. 1 wrought iron	10 00	9 00
Heavy melting steel	8 00	10.00
No. 1 machinery cast iron	13 00	14 00
New brass clippings	8 50	9 00
No. 1 brass turnings	7 25	8 00
Heavy lead	3 50	4 00
Teal lead	2 75	3 00
Scrap zinc	3 00	3 50

METALS.

	Mont'l.	Tor'to.
Lake copper	$17.00	$16.25
Electrolytic copper	17.00	16.25
Spelter	5.75	5.75
Lead	5.50	5.00
Tin	45.00	42.00
Antimony	9.75	9.00
Aluminum	22.00	18.00

SMOOTH STEEL WIRE.

No. 6-9 gauge, $2.25 base; No. 10 gauge, 6c extra; No. 11 gauge, 12 extra; No. 12 gauge, 20c extra; No. 13 gauge, 30c extra; No. 14 gauge, 40c extra; No. 15 gauge, 55c extra; No. 16 gauge, 70c extra. Add 60c for coppering and $2 for tinning.

Extra net per 100 lb.—Spring wire; bright soft drawn, 15c; charcoal (extra quality), $1.25.

SHEETS.

	Mont'l.	Tor'to.
Sheets, black, No. 28	$2 75	$2 90
Canada plates, ordinary, 52 sheets	2 90	3 00
Canada plates, all bright.	4 00	4 15
Apollo brand, 10¾ oz. (American)	4 30	4 20
Queen's Head, 28 B.W.G.	4 40	4 40
Fleur-de-Lis, 28 B.W.G.	4 20	4 25
Gorbal's Best Best, No. 28	4 40	4 40
Viking metal, No. 28	4 40	4 40

NAILS AND SPIKES.

Standard steel wire nails, base		$2 40
Cut nails	$2 60	2 65
Miscellaneous wire nails	75 per cent.	
Pressed-spikes, ⅝ diam., 100 lbs.		2 85

FINE STEEL WIRE.

Discount 25 per cent. List of extras. In 100-lb. lots: No. 17, $5; No. 18, $5.50; No. 19, $6; No. 20, $6.65; No. 21, $7; No. 22, $7.30; No. 23, $7.65; No. 24, $8; No. 25, $9; No. 26, $9.50; No. 27, $10; No. 28, $11; No. 29, $12; No. 30, $13; No. 31, $14; No. 32, $15; No. 33, $16; No. 34, $17. Extras net. Tinned wire, Nos. 17-25, $2; Nos. 26-31, $4; Nos. 30-34, $6. Coppered, 75c; oiling, 10c.

MISCELLANEOUS.

	Cents
Putty, 100 lb drums	$2.70
Red dry lead, 5 cwt. casks, per cwt.	6.00
Glue, French medal, per lb	0.10
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.26
Benzine, per gal.	23½
Pure turpentine	0.60
Linseed oil, raw	0.60
Linseed oil, boiled	0.63
Plaster of Paris, per bbl.	2.10
Plumbers' Oakum, per 100 lbs.	3.25
Pure Manila rope	17

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents.

Montreal, August 25, 1913.—The encouraging crop reports have caused a renewal of confidence in commercial circles, and it is generally anticipated that the volume of business done this fall will be large. Just at present, however, the machinery trade and allied interests are still very quiet. During the past week, one or two small orders have materialized, but nothing of much importance has developed, and there seems to be no immediate prospect of anything "turning up."

The Canada Iron Corporation.

On Thursday last, a not unexpected step was taken in connection with the Canada Iron Corporation's affairs. Since the cutting of the iron bounties a couple of years ago the company has had a hard time to make both ends meet, and finally, after two years' operation under bad conditions, has decided to wipe out its permanent fixed charges and start over again on a new basis. In order to do this in a regular manner, the directors decided to permit the appointment of a receiver, and on Thursday last an application was made by R. C. McMichael, of Brown, Montgomery & McMichael, representing certain creditors. Mr. F. F. Whyte, of New York, was appointed receiver to look after the affairs of the company. This gentleman is now in charge of the company. It has been announced by the officials that this is the first step in a re-organization of the company. Under the scheme, the mortgage debentures of the company will be retired, and the capitalization reduced to stock. Just how this will be done has not been decided upon, but probably part stock and part cash will be given in exchange.

Canadian Foundry Pig Iron.

Both the furnaces at Midland are now closed down, and are likely to remain so for some little time. Quotations on Canadian foundry pig will therefore be necessarily omitted from "Canadian Machinery's" market reports until such time as the Canada Iron Corporation's re-organization is completed.

Metals.

The market in metals remains fairly steady , with a slight tendency to rise. The present would seem to be a good time to buy, as dealers anticipate a very decided advance upon present low prices about a omnth from now.

Toronto, Ont., August 26, 1913.—While business in steel at mill prices is at a standstill, manufacturers preferring to do without rather than buy. Warehouse business is exceptionally brisk. There is a big demand for black sheets, plates, boiler tubes for rush jobs and repair work.

Machine Tools.

That the demand for machine tools still exists is shown by the specification sent out by R. S. Kent, of Brooklyn, N.Y., on behalf of the Atlantic Sugar Refineries, Ltd., St. John, N.B. Quite a number of firms are erecting new plants around Toronto, and should be buying new equipment. Considering the state of the money market, the amount of building going on is surprising.

Metals.

Big dealers in metals are advising those with metals on their hands not to sell, but to hold it until prices are better. The market for a week has been dead, with neither buying nor selling. Dealers declare they are not able to give stuff away. Everybody is playing the waiting game again. By Monday the market had become firmer and harder, but it was impossible to say what the future has in store. Dealers believe that these conditions cannot continue long, as very few consumers have stocks. The market in old iron and steel, like the metal market, is depressed.

St. John, N.B., August 23, 1913.—There is soon to be revived one of St. John's oldest and best known industries.

Connors Bros., who for many years conducted an extensive business here in the manufacture of rope in what was known as the "rope walk," have returned to the city from the West, and have purchased a block of land for the erection of a factory about 100 feet long and two storeys high. Both were in the rope business in St. John many years ago, but sold out to a combine, the understanding being that they would not manufacture rope in this city for twenty years. That period has now elapsed, and they plan to resume the manufacture. One of them said this week that the raw material can be landed in St. John quite cheaply, and, for a distributing point, conditions are splendid.

Lumber Industry Strike.

At present the outlook of a settlement of the strike which has demoralized the lumber industry about St. John all this summer seems a little more hopeful than for some time, but there is still nothing definite. One of the seven or eight big lumber mills have been shut down for about two months, that of Randolph & Baker has resumed operations, paying the old rate of wages to the men who have returned to work, and it is thought possible that the fact of this mill going may induce others to try to make a start. The wood-working factories and other industrial establishments are feeling the strike keenly as the supply of stock is hampered somewhat, while all the lime kilns in the neighborhood have been closed down for lack of fuel.

Canada Cement Co. Plant.

There is reason to believe that the Canadian Cement Co. plans to establish a big plant within a radius of thirty miles of St. John as an Atlantic centre. A gentleman in close touch with the cement situation said this week that the company proposes to erect this plant as soon as there is a market of sufficient importance in the Maritime Provinces.

St. Stephen, N.B.

At a meeting of the town council of St. Stephen, N.B. recently, there were opened tenders for the erection of a new shoe factory. The lowest, $10,855 was accepted and authority was given the finance committee to make whatever financial arrangements were necessary for the immediate completion of the building. The new industry is looked upon with much encouragement, and citizens generally are subscribing stock.

Sussex, N.B.

The Henderson Co. started borings for natural gas this week at Sussex, N.B., and the prospects for a successful well are apparently excellent. Should success greet their efforts at this place, it is reasonable to expect that before long there would be a pipe line for the supply of St. John. The company, said W. B. Dickson, M.L.A., this week, has met with success in Albert and Westmorland Counties where the supply of gas seems steadily increasing.

Stewiacke, N.S.

A new peg and woodenware factory is to be erected at Stewiacke, N.S., and a crew of men have been put to work making the preliminary arrangements. The building will be a fairly large one and will employ quite a number of men. G. E. M. Lewis, of Truro, N.S., is interested in the venture which is in connection wit hthe large tracts of timber area which Mr. Lewis secured from the Dickie estate some time ago.

AMERICAN LOCOMOTIVE CO. QUIT THE AUTOMOBILE FIELD.

THE American Locomotive Co., one of the three largest makers of automobiles in the United States, announced on August 20, that it had decided to abandon the manufacture of automobiles.

This decision was reached by the Board of Directors at a meeting on August 13, but nothing was said about it until after the second and later meeting. The following statement was given out on behalf of President W. H. Marshall:

"The directors of this company, at a meeting held on August 13, decided to discontinue the manufacture and sale of automobiles and motor trucks.

"The company takes this opportunity to assure all owners of ALCO vehicles that arrangements will be made to furnish them with repair parts for a period not less than five years to come, further, that it will fulfill in every respect its obligations given under guarantee to its customers."

The American Locomotive Co. engaged in the manufacture of high-priced cars in 1906, when it obtained the American rights to the Berliet car. Skilled mechanics were brought from the Berliet plant in Lyons, France, and an immense factory was built in Providence. The new car proved an immediate success from the buyer's standpoint.

Has $6,000,000 Invested.

The ALCO has been the highest priced car made in America, most of the pleasure cars selling for $6,000. In the past three or four years the company has been pushing the manufacture and sale of heavy trucks as a more profitable end of the business. It ranks third among the American manufacturers of commercial vehicles. In the past year 85 per cent. of its business has been in trucks and 15 per cent. in pleasure cars. It makes more taxicabs than any other concern in the United States. The ALCO has enjoyed the distinction of being the only automobile to win tthe Vanderbilt Cup twice. It won the great classic in 1909, and repeated the performance in 1910.

So far as can be learned from men familiar with the company's affairs, the ALCO car is not to be made by any other company, and the enormous plant at Providence will be dismantled. It is said that the American Locomotive Co. has $6,000,000 invested in the manufacture of motor cars. There are 1,200 employees at Providence, where high salaries have been the rule. It is understood that all of the employees other than those needed for the maintenance of service stations and in the manufacture of parts have been given thirty days' notice.

Besides the Providence plant, the company occupies an entire building at Broadway and Sixty-second Street, with a lease having fourteen years more to run. At Long Island City it has a completely equipped service plant, with a building which cost $100,000, where parts worth $125,000 are carried in stock. At Chicago it has a branch costing $112,000, while a service station on the Pacific Coast is valued at $175,000. In Philadelphia a building is leased by the company at an annual rental of $25,000, and one in Boston at $15,000.

The factory at Providence has a real estate value of $1,000,000, and is said to be the most complete plant of its kind in America. It contains a large amount of costly special machinery, a large chemical laboratory, testing grounds, and service station.

Sold Its Cars at a Loss.

Automobile men say that the ALCO always has been sold at a loss, owing to the remote location of its plant, the cost of getting raw material to Providence, and delays in making deliveries. The latter factor is said to have played an important part in running up costs. It is asserted that one-third of the company's output in recent years has reached the market after the season has closed. One well-known authority in the trade said that the company operated at a loss of $600,000 last year.

In an attempt to lower unit costs by increasing the volume of sales, Harry S. Houpt was engaged as general sales manager two and a half years ago. At that time the company had only four agencies. With a liberal advertising appropriation, Mr. Houpt began an aggressive campaign, which resulted in an increase of 365 per cent. in the sales and the acquisition of eighty-nine agencies for placing the cars. Houpt left the ALCO Company last March to take the New York agency of the Lozier.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Engineering

Ottawa, Ont.— Thomas McLoughlin, contractor, had much machinery used in excavation work destroyed by fire here on Aug. 19.

Vancouver, B.C. — Fire destroyed the plant of the Empire Engine Works, corner Sixth avenue and Alder street, Kitsilano, causing a loss of $10,000.

Sherbrooke, Que. — The Canadian Brake Shoe Co. will shortly commence operations in Sherbrooke. It will make steel and brass forgings by electricity.

Quebec, Que. — The plans for the workshops of the National Transcontinental Railway at St. Malo are on exhibition at the engineers' office here. Tenders are to be called for on Sept. 1.

Montreal, Que. — Allan G. McAvity, the representative of the Canadian Buffalo Forge Company, of Montreal, has announced that the company contemplated starting building at Berlin, Ont., in about two weeks.

Toronto, Ont.—Wm. and J. G. Greey have secured a permit to build an addition to their foundry at Esplanade and Church streets. It will be of concrete and brick construction, and will cost $15,000. Some equipment will be purchased.

The Doherty Mfg. Co., Sarnia, Ont., makers of stoves, have built new offices, warerooms, and shipping rooms of 3-storey construction, costing $25,000. This will give them more room for manufacturing. The mounting and fitting shop is being enlarged.

Windsor, Ont. — The Kelsey Wheel Company and Canadian Roofing Company, two of Windsor's promising manufactures which recently located in the city, have paid to the city treasurer $2,800 for property in the factory district. The Kelsey Company's cheque calls for $2,000, while the Canadian Roofing Company paid $800.

Medicine Hat., Alta. — The Western Threshing Machine Co. have deposited with the city council of Medicine Hat $1,000, as an evidence of their good faith in entering into a contract with that city for certain concessions which include free gas for five years and three acres of land, with an option on two more.

Sault Ste. Marie, Ont.—The new $60,000 coal unloader on the Ontario dock was destroyed in a cyclone on Aug. 22. It was owned by the Playfair interests, and had only been completed two hours. The unloader was of double tramway type, and was one of the most up-to-date on the great lakes. With its great capacity it would have unloaded an eight-thousand-ton vessel in one day.

MACHINE TOOL SPECIFICATION.

Specifications for the following equipment have been sent out by R. S. Kent, Mechanics' Bank Bldg., Brooklyn, N.Y., who is buying machine tools for the new St. John, N.B., plant of the Atlantic Sugar Refineries, Ltd., Montreal.

Machine Shop.

- 36 in. lathe.
- 20 in. lathe.
- 12 in. lathe.
- 48 in. planer.
- 24 in. shaper.
- 51 in. vertical boring mill.
- 1½ in. bolt cutter.
- 1 power hack saw.
- 24 in. drill press.
- 40 in. do.
- Wet tool grinder.
- Machinist vises.
- 5-ton hand traveling crane.
- 2 hydraulic jacks.
- 6 in. pipe threading machine.
- 12 in. ditto.
- 2 combination pipe vises.
- 6 in. to 12 in. pipe vise.

Blacksmith Shop.

- 2 forges.
- 2 anvils.
- 2½-ton steam hammer.

Coppersmith Department.

- 1 forge.
- 15-ton hydraulic bending machine.

Carpenter and Pattern Shop.

- 24 in. turning lathe.
- 26 in. band saw.
- 1 circular saw.
- 2 wood trimmers.
- 1 universal wood worker.
- 1 grindstone.

Montreal, Que.—Work on the Longueuil plant of the Sir W. G. Armstrong, Whitworth & Co., Ltd., is progressing. M. J. Butler announces that the concrete foundations are almost completed. The first building will be up by the middle of December, and the plant will be running by May 1, 1914. This part of the plant will be equipped for the manufacture of high speed steel, twist drills and other high speed tools. Other departments will gradually be added.

Vancouver, B.C.—Arrangements have been made by the American Can Company for the establishment of a local branch at Vancouver. A modern structure of reinforced concrete is to be erected at a cost of $100,000, and construction will be started at an early date. Excavation operations are now being carried on. The American Can Company is a corporation with its head office in New York. Contracts have been entered into with the Imperial Oil Company, and a number of the salmon and fruit packers for supplying tins.

Electrical

Montreal, Que.—The Halifax Electric Tramway Co. have issued new stock for extension and improvement of the system.

Toronto, Ont. — In connection with the steam reserve plant to be constructed by the local Hydro-electric Commission Chief Engineer H. H. Cousens is investigating a proposal to utilize the exhaust steam for heating purposes.

Guelph, Ont. — North Wellington is taking up the hydro power question. Hon. Adam Beck will address a meeting in Elora and Fergus, both meetings being in the interests of hydro electric power installation in the two towns.

Brampton, Ont. — The Erindale Light & Power Co., has applied to the Toronto Township council for permission to raise $50,000 on property to complete dam and generate 500 more horsepower. At present, only 400 horsepower are generated.

Prince Albert, Sask.—The city council has decided to suspend operations to some extent on the La Colle Falls dam, owing to lack of funds. Excavations for the tail race and spillway will be continued. J. M. Voith, Heidenheim, Germany, was awarded the contract for power equipment for this scheme.

Toronto, Ont. —Cluster lights of 500 candle-power are to be placed over the centres of the roadways at the important corners in the city, the experiments of the Hydro-Electric Commission with them having proved a success. There will also be 300 candle-power clusters hung over the less important intersections.

Port Hope, Ont.—The Seymour Power Co., Toronto, will instal additional equipment costing $10,000. The ratepayers have granted them a ten-years' franchise to supply power.

New Toronto, Ont.—The Ontario Hydro-Electric Commission has informed the council that the material for the proposed power and light system has been ordered.

General Industrial

Holland, Man.—The Farmers' elevator here, has been destroyed by fire. The loss is estimated at $10,000.

Brampton, Ont.—The Terra Cotta Brick Co.'s engine house was destroyed by fire Aug. 20.

Toronto, Ont.—Robert Crean & Co., Ltd., hat manufacturers, will re-build their plant on Balmuto street.

Fort William, Ont. — The F. A. Guy Grain Co., is erecting a grain drying plant in connection with its elevator.

Montreal, Que. — The plant of the Rideau Shirt Mfg. Co., in Maisonneuve, Que., was burned down on Aug. 22.

Greenwood, B.C.—A local company will build a canning factory in Grand Forks at a cost of $13,000.

Greenwood, B.C.—The Steelite Explosive Co. has bought a site on Mill Creek, across the lake from New Denver, and will build a factory.

Revelstoke, B.C.—The West Kootenay Steam Laundry, owned by Earl Barraclough, was destroyed by fire Aug. 16. Loss $20,000.

Kingston, Ont. — The model cheese factory at Inverary, was destroyed by fire Aug. 22. It was valued at $8,000, and insured for $2,000.

Toronto, Ont. — A new laboratory for electro-plating will be equipped at the new Central Technical School by the Electro-Platers' Association.

Halifax, N.S.—As a result of the inauguration of direct sailings between Halifax and Italy, this city may become the site of a silk manufactory if negotiations now under way materialize.

Toronto, Ont. — Wilkinson & Gregg have obtained a permit for the erection of a brick warehouse for Ald. Rawlinson at St. Nicholas and St. Joseph Sts. It will cost $26,000.

Winnipeg, Man. — After inspecting conditions here, Col. F. S. Meighen and W. H. Hutchinson, president and vice-president, respectively of the Lake of the Woods Milling Company, have decided to erect another mill in the West.

Oshawa, Ont.—Col. J. F. Grierson and Mr. T. B. Mitchell were in Toronto recently interviewing the officers of the Eastern Rubber Company, relative to locating in Oshawa. It has been known for some time that this industry has had its eye on this town as a most suitable place to establish its business.

Toronto, Ont.—An order winding up the Dominion Refineries of North Bay was made at Osgoode Hall last week, and no opposition was offered to the application. The company was incorporated in 1911 with a nominal capital stock of $50,000. 21,347 shares have been allotted, and $11,791.42 will be paid up.

Lethbridge, Alta.—The Ogilvie Co. will shortly erect a series of elevators in Southern Alberta to act as feeders to the new Medicine Hat mill just completed. Coaldale or Cin will be selected as one of the sites, while the other two have not been decided upon as yet. Mr. Black is at present in the West making arrangements for these improvem[illegible]

Vancouver, B.C. — A powder plant will be established on James Island, B. C., by the Canadian Explosives, Ltd., a company recently reorganized to inclu[illegible]e the Hamilton Powder Company and the Victoria Chemical Co., Ltd., and the controlling interests held by the Nobel's Explosives, Ltd., of Glasgow, Sctoland. A plant to cost about $1,250,000, will be built on an 800-acre islet a short distance from Victoria, B.C. Most of the machinery will come from England and the United States, although some will be the output of Canadian factories. The output of the new factories will be 100 tons of high explosives and black powder daily.

Wood-Working

Morden, Man.—The chopping mill of A. H. Snellgrove, with machinery, was destroyed by fire Aug. 19.

Omemee, Ont.—Courtney's saw and shingle mill was completely destroyed by fire August 12. There is no insurance.

Goderich, Ont.—On August 22 the Kensington Furniture Company was completely destroyed by fire. The loss is about $40,000, mostly covered by insurance.

London, Ont. — Industrial Commissioner Philip will endeavor to secure the establishment here of the Kensington Furniture Co., whose big plant at Goderich was wiped out by fire last week. The chief shareholder is F. G. Rumball of this city, who is interested in other woodworking factories in London, and it is believed that he might be induced to bring the furniture industry to London.

Quebec, Que.—Mr. E. T. Nesbitt, who recently acquired the old Brown rope walk property at Limoilou, and intends to erect a large lumber manufacturing factory on it, was granted an exemption of taxes for a period of ten years at the meeting of the City Council recently. He intends to erect one of the most modern plants of wood manufactory, and in the connection will have erected a planing mill 200 feet long by 100 wide.

Water Works

Melville, Sask.—The town council is planning the installation of sewage disposal works. The secretary is F. H. Clarkson.

Swift Current, Sask.—Bylaws to provide $80,000 for waterworks system and $28,500 for erection and equipment of fire hall have been passed.

Leaside, Ont.—At a meeting of the council last week, it was decided to raise $60,000 for a water-works system. and $60,000 for sewers. Mayor McCrea.

Calgary, Alta. — A. W. E. Fawkes, waterworks engineer, has planned a 44-mile pipe line to the Rocky Mountains. The whole scheme will cost over $1,000,-000.

Toronto, Ont.—That a site for a new reservoir in North Toronto is actually under consideration by the city is evinced by the activity on the old Gartshore property west of Yonge street and just north of Eglinton avenue.

Toronto, Ont.—A recent water famine on the Island has proved the 6-inch mains there to be inadequate. It was designed to supply 500,000 gallons. Mayor Hocken is urging the installation of a better system, with bigger pumps.

Stamford, Ont.—The municipality of the town of Stamford will instal a water plant, with stand pipe, pressure tanks, pumps and other accessories.

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A carelessly thrown match or cigarette, an over-heated bearing, spontaneous combustion or an incendiary have no terrors for the manufacturer whose plant is protected by

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PROMPT DELIVERIES
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Let us figure on your requirements

THE DOMINION STEEL CASTINGS COMPANY, Limited
HAMILTON, - - - ONTARIO

Arthur G. Bridge, Stamford, is conducting negotiations.

..**Quebec, Que.**—A petition, signed by the Mayor of Sherbrooke, other towns, and also many leading merchants of the Eastern Townships, has been forward to Hon. Jules Allard, Minister of Lands and Forests of the Province of Quebec, requesting that storage reservoirs be constructed and operated at the head of the St. Francis River.

Railways—Bridges

Welland, Ont.—It is proposed to erect a new bridge across the canal here.

Ottawa, Ont.—The new C.N.R. line, Ottawa, Smith's Falls and Toronto, is nearing completion, but it will be the beginning of the year before it will be open for regular traffic all the way.

Toronto, Ont.—Work on the Toronto Eastern Electric Railway, is practically at a standstill, though the grading is all finished between Pickering Village and Bowmanville. West from Pickering Village to the city the exact line has not yet been definitely settled, and it is likely that the northerly route may be abandoned in favor of the Cherrywood district.

Montreal, Que. — Semi-official announcement has been made that the Harbor Commissioners will commence the construction of a steel bridge across the St. Lawrence River early next spring. Draft copies of the plans of the new bridge have, it is said, been sent to the municipal authorities of St. Lambert, the municipality immediately opposite McGill Street, Montreal.

Welland Ont.—The G.T.R. line from Niagara Falls and from St. Catharines through Welland is being gone over by representatives of the Pennsylvania Railway. The explanation generally accepted is that the Pennsylvania has designs on the Wabash system which runs over the G.T.R., and it is said that negotiations are now in progress to buy out the Gould system.

Hamilton, Ont.—Actual work on the Port Dover, Dunnville, Wellandport and Beamsville Electric Railway, which has been hanging fire for several years, will be started this week. The new line will connect with the Hamilton, Grimsby & Beamsville Railroad at Beamsville, and from Beamsville to St. Catharines a connecting road will be built to connect with the Niagara, St. Catharines and Toronto Railway for Niagara Falls.

Tenders

Welland, Ont.—Tenders for the erection of the plant for the Union Carbide Co., at Welland, Ont., are now being called for, and the contract will likely be let within a week or two.

St. Catharines, Ont.—Tenders will be received by the Armstrong Cork Co., Pittsburg, Pa., for the erection of a one-storey plant, costing $40,000, concrete foundation, frame and galvanized iron construction.

Toronto, Ont. — Tenders have been called for three 180 h.p. water tube boilers. Four direct-connected d.c. generators, elevators, stokers and feed-water heaters, for the new Dominion Bank, at the corner of King and Yonge streets. The Canadian Stewart Co. are general contractors. The contracts will be awarded this week.

Toronto, Ont.—The principals of the T. A. Gillespie Company, of New York, Messrs. Laurin and Leitch of Montreal, and of Messrs. Booth and Flynn, of Pittsburg, three large contracting firms, were here last week to consider the joint bid which they propose making for the harbor improvement contract. The bid will be made under the name of the Montreal firm, and will be for the breakwater and seawall. Engineers of the concerns have been in the city for some weeks gathering information.

Ottawa, Ont.—Tenders, addressed to the undersigned, and marked on the envelope "Tender for Shops," will be received by the Commissioners of the Transcontinental Railway at Ottawa, Ontario, until 12 o'clock noon of Tuesday, 2nd September, 1913, for the construction and erection complete, in accordance with the plans and specifications of the Commissioners, of a locomotive and car shop repair plant at St. Malo, P.Q. The plans, details and specifications, which will include the locomotive and car shops, the yard sewerage system and drainage system, yard water system, and the yard grading and track-laying, may be seen at the office of Mr. Gordon Grant, chief engineer, Ottawa, Ontario, and at the office of Mr. A. E. Doucet, district engineer, Quebec, P.Q.

Contracts Awarded

Toronto, Ont.—The contract for the equipment of the new civic abattoir has been awarded to Mr. Perrin, the architect in charge of the building, for $108,376.

Edmonton, Alta.—H. F. Brackenbridge has been awarded by the Wabamun Power & Coal Co., the contract for cutting a 1,000-foot tunnel at its mine, which is half a mile north of the G.T.P.

Toronto, Ont. — Messrs. Donnelly, Graham and Gerow, of Cleveland, O., have been awarded the contract for sewers costing about $700,000. Compressed air will be used.

Cobalt, Ont. — The contract for the building of the new town hall was awarded at a special meeting of the council to Hill, Clark & Francis of New Liskeard. Their price was $37,700.

New Incorporations

L. E. Moulton & Co., Ltd., incorporated at Ottawa, capital $50,000, to do business as pipe makers and contractors, at Montreal; incorporators: Lyman E. Moulton, Joseph A. Cousineau, etc., Montreal.

Ecothermal Stove Co., of Canada, Ltd., incorporated at Ottawa, capital $100,000, to manufacture and sell stoves, ranges, etc., at Kingsville, Ont.; incorporators:—Bon Jasperson, George Jasperson, etc., Kingsville, Ont.

Southern Canada Power Co., Ltd., incorporated at Ottawa, capital $3,000,000, to carry on the business of a light, heat and power company, at Montreal, incorporators: — Charles H. Cahan, Orick Burroughs, etc., at Montreal.

Toncan Mfg. Co., Ltd., incorporated at Toronto, capital $250,000, to manufacture and deal in all kinds of tinware, etc., at Dundas, Ont. Incorporators: Alonzo C. Caldwell, Dundas; William A. Welsh, Hamilton.

Douglas Ice Co., Ltd., incorporated at Toronto, capital $50,000, to manufacture, buy, sell and deal in ice and ice-dealers' supplies, at Niagara Falls, Ont. Incorporators: Frank A. Douglas, Henry A. Campaigne, Niagara Falls, Ont.

Agricultural Implements Mfg. Co., Ltd., incorporated at Ottawa, capital $75,000, to manufacture, purchase, repair and to carry on the business of wholesale or retail dealers in implements, etc., at Quebec; incorporators:—Frederic C. Dufour, Alice M. Bilodeau, etc., Quebec.

Ottawa, Ont. — A new half million dollar oil company composed of British and Canadian capitalists has been Federally incorporated, with twenty-nine subsidiary companies, each capitalized at $75,000. The company is called the Pecoi Drilling Company, Ltd. The company is empowered to develop and operate oil wells, construct pipe lines, etc. The head office is in Toronto.

Observations on Bending and Welding Rolled Sections I

By Joseph Horner

The writer of this article, perhaps more than any others who have contributed to the editorial columns of the world's leading technical journals, is a recognized authority on workshop practice, whether the latter be the drafting room, pattern shop, foundry, machine shop or millwright section feature; and readers of "Canadian Machinery" engaged or interested in either of these branches of the mechanical engineering industry will find the regular occurrence and variety of subjects herein treated, helpful and instructive.

THE bending and welding of rolled sections differs in several aspects from the bending and welding done by the smith on bars and rods. It is complicated by the fact that rolled sections have webs standing in angular relations to each other—at right angles usually. When these are wide, and lie in the plane of bending, and the curves are quick, the metal is greatly extended on the outer radii and compressed on the inner. Crinkling and buckling occur in the bending of curves, while sharp angles cannot be turned, but the metal must be severed and made good by welding. Another point is that welding has to be done over large surfaces and over wide, but relatively narrow edges. This renders the making of sound lap or butt joints difficult, and gluts are frequently preferred. Again, the pieces of work handled are often large, awkward and heavy, which increases the difficulty of manipulation, so that various rigs-up are required. These also must be readily and rapidly applied, otherwise the metal would cool down before much work could be done upon it, and the number of heats would be increased and economy sacrificed. The process is considered the most difficult department of boiler work.

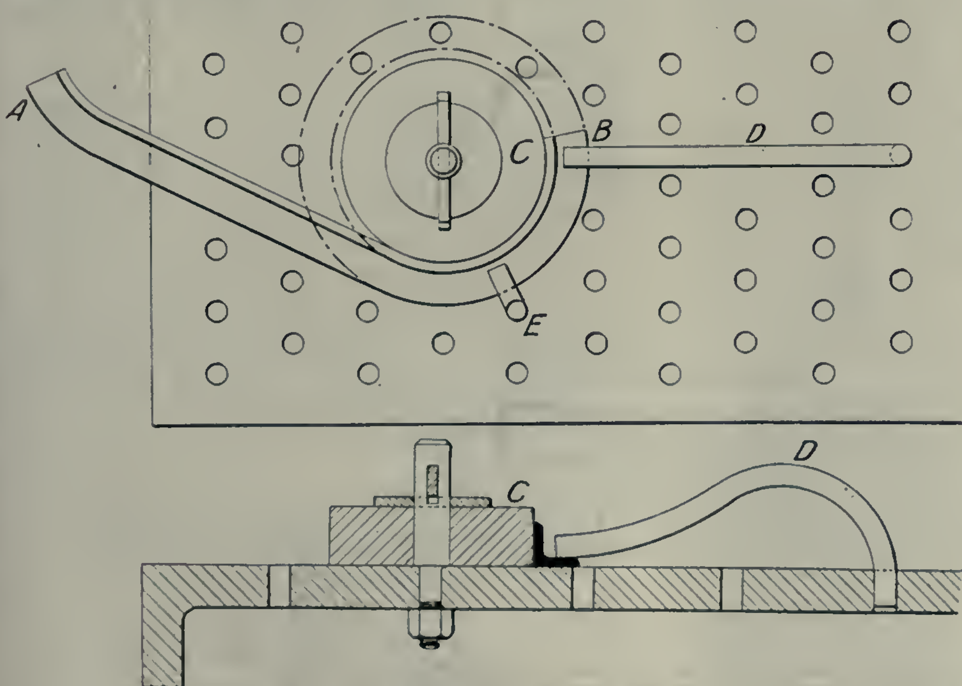


FIG. 1. BENDING A SMALL RING.

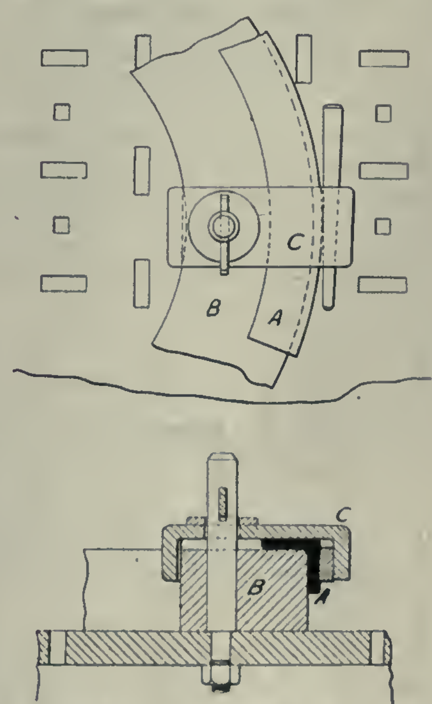


FIG. 3—METHOD OF CLAMPING A RING.

The Angle Smith.

A good angle-iron smith is exceptionally valuable in a shop, because, in addition to angles, he can perform work on such sections as tees, channels, etc., on tubular work, and other details in iron and steel which have to be bent and welded. The methods adopted are similar in all, as the broad flat portions have to be cut, bent and welded, and allowances made for the bending. Rolled sections can be bent and welded into almost every conceivable form, and it would be difficult to give a skilful smith a job within the legitimate range of engineering which he could not accomplish. The simplest cases which can occur are those that involve the formation of regular curves. Flat curves or those of large radius are very easily turned, but quick ones not so readily. Pieces that are bent at sharp angles cannot be treated without making welds at the corners, but angles of few degrees can be bent when uniting welding with bending by the methods here shown.

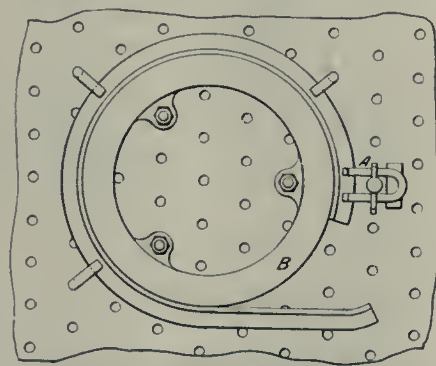


FIG. 2—BENDING A RING.

Only a comparatively small part of this work can be heated in a smith's fire. It can be done by rigging up a hollow fire of bricks, enclosed with plenty of fuel to make a "solid core" of heat, and taking short heats. This, however, is very wasteful of time, because a large ring can be turned at one heat if a reverberatory furnace is available. The smith's fire is suitable for heating ends to be welded, and gluts for welding, but not for long pieces of rolled sections.

Rolled sections may be bent to form short curves connecting straight portions, into complete rings of small or large diameters, or into long curves of regular or irregular contours. Naturally only portions which have to be bent need to be heated. Bending is always accompanied by methods or securing, followed by correction on or around a block or blocks. The basis of such work is generally the shop levelling block, and it may in some cases be used alone, but usually another block around which the work is bent is bolted or cottered down on it.

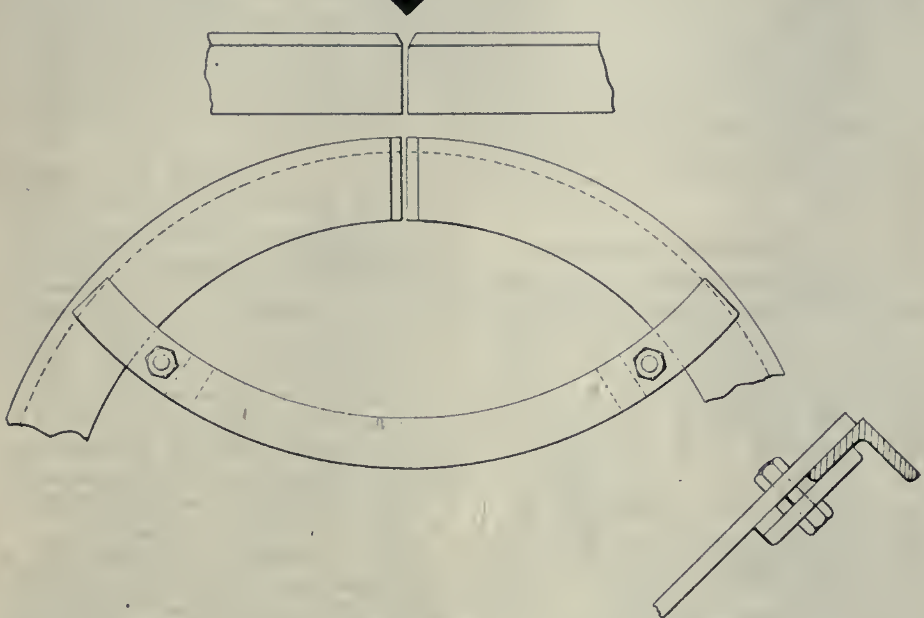
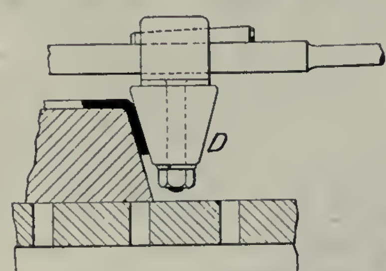


FIG. 4—METHOD OF HOLDING A RING FOR WELDING.

Bending Small Rings.

Fig. 1 illustrates a common piece of work, the bending of a small ring of angle section, such as would be used in the uptake of a vertical boiler. Before bending it to the circle, the ends (A) and (B) are heated and bent for a short distance to the curve, these being more easily done thus than subsequently. Then the whole length of bar is heated and rapidly pulled round the block (C), which is cottered down on the bending block.

First, the end (B) is gripped down by the holdfast (D), formed of a bit of rod bent round, or by other suitable means, as in Fig. 2, and the free end (A) is pulled round by angle-iron tongs, the jaws of which are shaped to grip the outside and inside of the angle. While one man pulls round, another delivers blows against the webs of the angles to remove the puckering that occurs, and to cause the webs to lay close to the levelling and templet blocks. Clamps like (E) or (D) are driven at intervals to hold the work down. When (A) has been pulled round to (B), the final setting is done with the sledge, and the ring is removed to receive the heat for welding. Welding is done by means of gluts, as shown in Fig. 4.



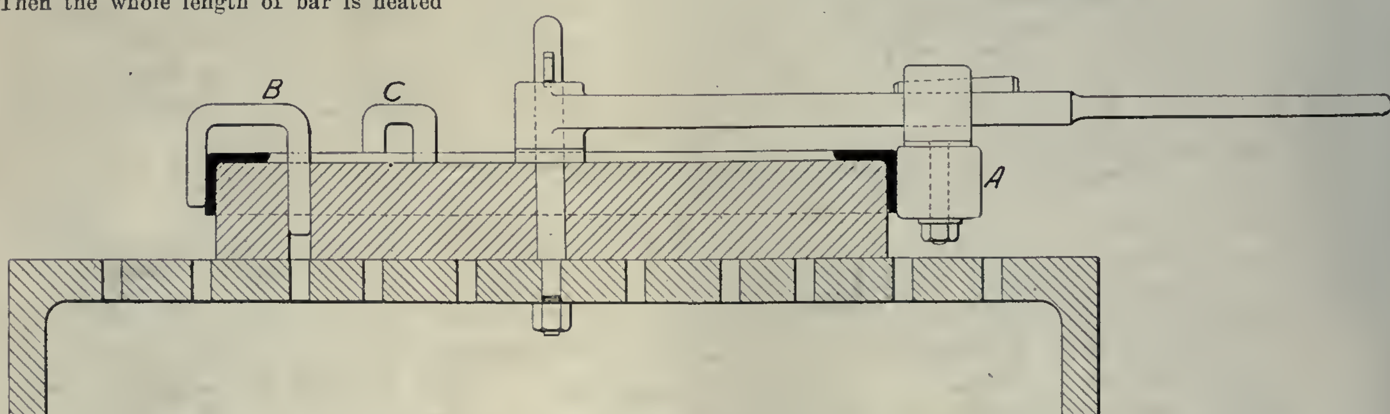


FIG. 6. BENDING AND CORRECTING A RING BY ROLLING.

Bending Large Rings.

Larger rings, like that in Fig. 2, are bent with less difficulty, because less puckering occurs, and, therefore, less correction is required with the hammer. A single heat suffices for the bending. In this case an alternative clip is shown. It comprises a piece of iron bar (A), bent round into horseshoe form, resting on the web of the angle at one end, and a packing piece at the other, and held down with a cotter bolt. The templet block (B) is a ring only, with internal lugs, through which it is bolted to the levelling block.

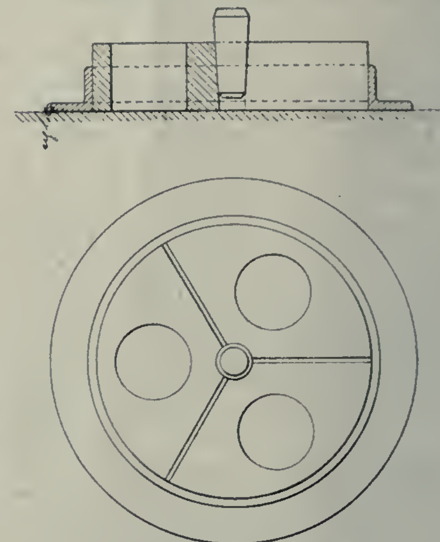


FIG 5—SETTING A RING.

One method by which an internal ring can be gripped on its bending block is seen in Fig. 3, where (A) is the angle, (B) the bending block, and (C) the clip. The latter is pulled down with a cottar bolt on a washer, holding the flat web down. The vertical web is held close up to the block by a wedge or wedges.

The Welding Feature.

When rings are being welded, all except the smallest must be secured, or the insertion of the glut would thrust

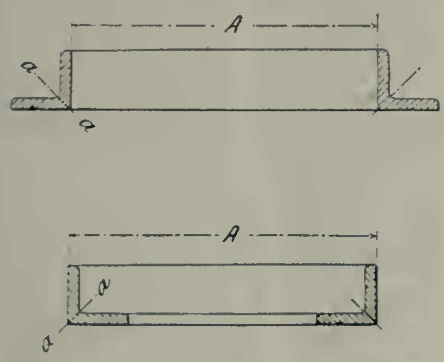


FIG. 7. MEASUREMENT OF LENGTH FOR RINGS.

them apart. A small ring like Fig. 1 is rigid enough not to require any help, but rings like Figs. 2 and 3 must have a strap to hold the ends together, one form being shown in Fig. 4. Nearly always the weld is of the glut form, as in Fig. 4, two separate gluts being required, one for each web, and each requires a separate heat. The glut is of the square section shown, or else of the vee form. It is heated at the end of a length of bar to form a porter, and cut off after the weld is made. Sometimes small rings have lap welds, but the glut is generally preferred and is more secure.

When considerable numbers of small rings are being made, time is saved and uniformity in dimensions secured by taking a final heat after welding, and correcting and setting them around a templet, Fig. 5. This is not solid, because the cold shrunk ring could not be got off a solid centre. It is made in three pieces, with clearance, and with a central tapered plug, which, being driven in, opens the segments against the ring. The setting being then completed with the hammer, the removal of the pin allows the segments to fall inwards, and the ring to be removed.

A permanent rig-up for the bending and the after correction of the larger rings is shown by Fig. 6. Here a roller (A), adjustable along a radius bar, on which it is fixed with a wedge, is used to coerce the ring which is being bent. First, one end is secured with a clamp or holdfast, such as (B), in one of the holes of which numbers are cast in the bending block; then as the ring is pulled round by hand and the roller, other clamps as at (C) will secure it until the circle is complete. A radius-bar, like that shown, will serve for a large range of diameters by substituting fresh bending blocks. Rings of bevelled section can be turned generally well, by employing a conical roller and a block with an edge suitably bevelled, as at (D) in the upper part of Fig. 6.

Length of Bar for Ring.

To estimate the length of bar necessary to bend a ring of angle section it would not do to take the mean diameter of the ring, and multiply that by 3.1416. It would make the ring much too large. There are, however, several rules used in the shops, which all work out correctly within fine limits. In all cases, the thickness of the metal in the throat, measured diagonally at (a) (a) in Fig. 7, is a cardinal dimension, in addition to the diameter (A).

A correct rule is—to the interior diameter (A) add twice the thickness of the throat measured along the line (a) (a), and multiply the same by 3.1416.

For interior angles, from the exterior diameter (A) subtract twice the diagonal thickness on the line (a) (a), and multiply the sum by 3.1416.

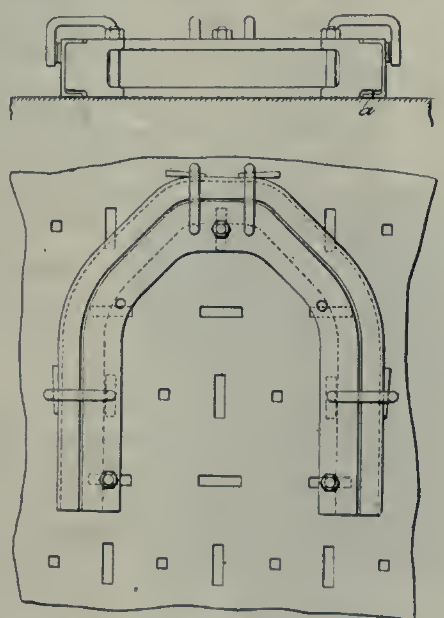


FIG. 10—BENDING CHANNELS

Bending to Irregular Curves.

When rolled sections are bent to curves that are not regular, the work is often done directly on the levelling block, Fig. 8, without any aid beyond that available from wedges, pins and packing pieces. This is shown in Fig. 8. The outlines of the curves required may be marked on the block, on a piece of plate, or a floor, to which in this case the work will be transferred and checked.

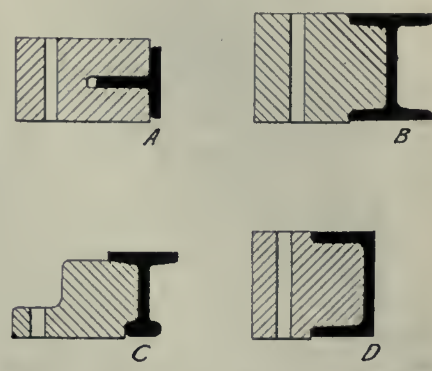


FIG. 9—SECTIONS THROUGH BENDING BLOCKS.

When portions of bars are straight and portions curved, and the latter only are heated, the straight portions are pulled round readily by hand without using special tongs.

Block Features.

When sections other than angles have to be bent, suitable blocks can be made. Four of these are illustrated in section, Fig. 9, and comprise a tee (A), a joist (B), a rail (C), and a channel (D). Fig. 10 shows a block as made for bending channels to a particular shape for a job where some dozens were required. It is self-explanatory, being but an application of methods already described. Note that clearance is given at (a), next to the lower flange, without which the work would get fast on the block.

Although these examples all deal with work that is bent in a horizontal plane, it will be obvious that similar methods are adopted when for various reasons the bending is done in a vertical plane. The working edges of the blocks will then be uppermost, but cotters, clamps and wedges will be used as in these examples.

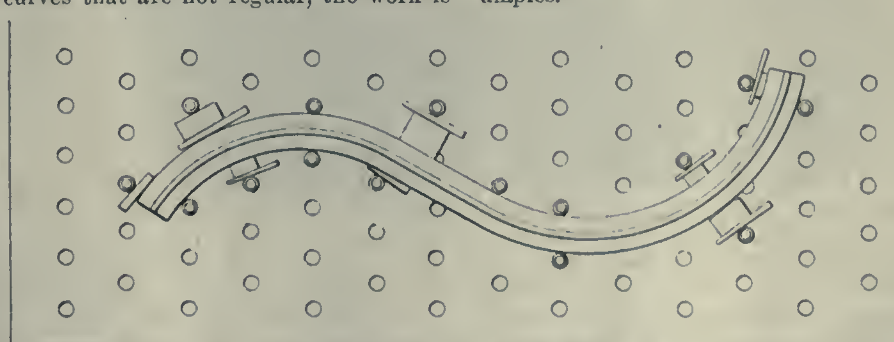


FIG. 8—BENDING ON A LEVELLING BLOCK.

LUBRICATING VALUE OF CUP GREASE.

AT a recent meeting of the American Society of Mechanical Engineers, Mr. A. F. Westcott read a paper upon the lubricating value of cup grease. In an able resume of the subject, he said that he had arrived at the following conclusions:—

(1)—Grease lubrication compares favorably with oil where the form of bearing is such as to favor the retention of the film of lubricant, and provision is made for an ample supply to the bearing; but oil will give better results in case of a short bearing in proportion to the diameter.

(2)—Grease of soft consistency is a much better lubricant than the harder densities of the same grease. The advantage of the softer grease is especially marked at low temperatures, such as usually obtained in a well-lubricated bearing.

(3)—The best method of applying grease to a bearing is by forced feed and a constant rate of flow. This agrees with the best practice in oil lubrication where the bearing is flooded with oil, which passes to a filter and is used again. The drawback in case of grease is in cleaning it after it has once passed through the bearing, so that it can be used again. Intermittent application of grease means irregularity in the value of the co-efficient of friction.

(4)—Grease cups with spring-actuated plungers are designed to give a constant flow of grease. They are far from accomplishing this purpose, however. Experiments upon grease consistency show what a great difference in flow is produced by a small change in the pressure upon the grease. A design of cup is desirable which will deliver the grease at a constant rate from the time it is filled until it is empty.

SMOKE INSPECTION SHAKE-UP IN CHICAGO.

CHIEF OSBORN MONNETT, of the Chicago City Department of Smoke Inspection, took the initiative, says The Industrial World, in a "house-cleaning" in his department recently by summarily discharging nine of his eleven deputy inspectors. The discharged men demanded a hearing on the charges preferred by Chief Monnett.

Mr. Monnett and Assistant Corporation Counsel Leon Hornstein have been supervising an investigation for some time, and have just completed the work on which the action is based. The nine deputies are under eight general charges, including petty graft, loafing, false reporting and insubordination, taking place in the last three years. The following are the charges against the deputies in detail:

1.—Disregarding the duties to which he was assigned, he spent much of his time, while he was believed by his superior officer to be on duty, at other pursuits not connected with his duties or with the department of smoke inspection.

2.—In making his reports he made misrepresentations in regard to the places where he was, the time when he was at work, and the manner in which he employed his time.

3.—He neglected to report violations of the ordinances relating to dense smoke when he knew that such violations existed.

4.—He made out reports at times when he was not actually on duty, but was supposed to be, charging violations of the smoke ordinances when none were observed by him at the time of making such reports.

5.—He used his official position to obtain favors from persons who were prosecuted or were liable to be prosecuted for violations of the ordinances relating to dense smoke.

6.—He visited engineers and others connected with the boiler rooms of buildings and conversed with them in regard to their duties, contrary to the rules of the department of smoke inspection.

7.—He sought to influence parties using coal, engines and boilers, concerning materials and appliances which they required.

8.—He conspired with other deputy smoke inspectors to cast discredit on the smoke inspector, and to bring the department of smoke inspection into disrepute as being inefficient and partisan.

Appliance Companies Involved.

Mr. Monnett indicated some of the charges he might substantiate at the hearing, in the following statement:

"We shall be able to show that two or three big coal companies and two or three big appliance companies were concerned in a conspiracy with the smoke inspectors we have suspended. This conspiracy has for its dual purpose the influencing of building owners toward the purchase of coal and appliances handled by the firms in question and the discrediting of the heads of this department in order that the inspectors might gain an even greater influence over factory and building owners.

"The accused men and the corporations whose names will enter into the hearings," said Mr. Monnett, "are very anxious that we should reveal, through the newspapers or otherwise, some of the specific incidents upon which we base our charges. We do not propose to give them such an advantage."

CANADIAN PIG IRON.

THE Bureau of Statistics of the American Iron and Steel Institute has received direct from the manufacturers complete statistics of the production of pig iron in Canada in the first six months of 1913. Every furnace has been heard from. Statistics for the whole year 1912 were also compiled by the bureau.

The production of pig iron in Canada in the first six months of 1913, including ferrosilicon and ferro-phosphous, amounted to 545,981 gross tons. The output in the whole of 1912 was 912,878 tons. The production of pig iron in the two halves of 1912 is not available. Of the total in the first six months of 1913, 532,481 tons were made with coke, and 13,550 tons with charcoal, coke and electricity, etc. In the whole year 1913, Canada will probably make over 1,000,000 tons of pig iron.

The production of basic pig iron in Canada in the first half of 1913 amounted to 292,625 tons, Bessemer pig iron, ferro-silicon, ferro phosphorous, etc., to 128,304 tons.

Of the 545,981 tons of pig iron produced in the Dominion in the first six months of 1913, 345,810 tons were delivered to mixers, open-hearth furnaces, etc., in a molten condition, 141,680 tons were sand cast and 58,491 tons were machine cast.

CANADIAN - AMERICAN POWER CORPORATION.

THE Canadian-American Power Corporation, which has been incorporated under the laws of New York, with offices at Niagara, by interests associated with the re-organization of the Buffalo and Lake Erie Traction Co., will be subsidiary corporation of the re-organized traction company.

The Canadian-American Power Corporation takes over a contract which has been made with the Electrical Development Co., Ltd., of Ontario, and the Toronto Power Co., Ltd., for the delivery of 46,000 horse-power of electrical energy by these companies at the international border. This contract will assure the re-organized traction company an abundance of power for the operation of its lines, and will leave a large surplus, which will be sold for lighting and power purposes in the territory between Buffalo, Rochester, Niagara Falls, and Erie, Pa.

The directors of the power company are: E. G| Connette, Buffalo; S. Reading Berton, Marshall J. Dodge and Francis T. Homer, New York, and Rodman E. Griscom, Philadelphia.

Elements in the Manufacture of Frictionless Bearings*

This article describes the methods employed in the manufacture of ball and roller bearings, and gives prominence to the important part played by grinding equipment in the attainment of high degree uniformity, desired accuracy and quality of product.

IN this modern age of process and development it would seem that a limit had almost been reached where the inventive genius might deservingly cease from his labor and take a well-earned rest. During the past quarter of a century this development has been so rapid and pronounced that even the most optimistic are forced to stand aside and consider with amazement the phenomenal accomplishments of the past and the tremendous possibilities of the future.

Scientists and inventors are devoting their whole time and energy in attempting to fathom the seemingly impenetrable forces of nature. They have already transformed electricity, one of the most mysterious elements of the universe, from a terrible master into a valuable servant, and they have harnessed and controlled vast cataracts of water for further developing this wonderful force for the use of man. A hundred-and-one instances might be enumerated where science has mastered natural forces, yet we are still only at the beginning, and cannot begin to foresee what the future will bring forth.

Friction Elimination.

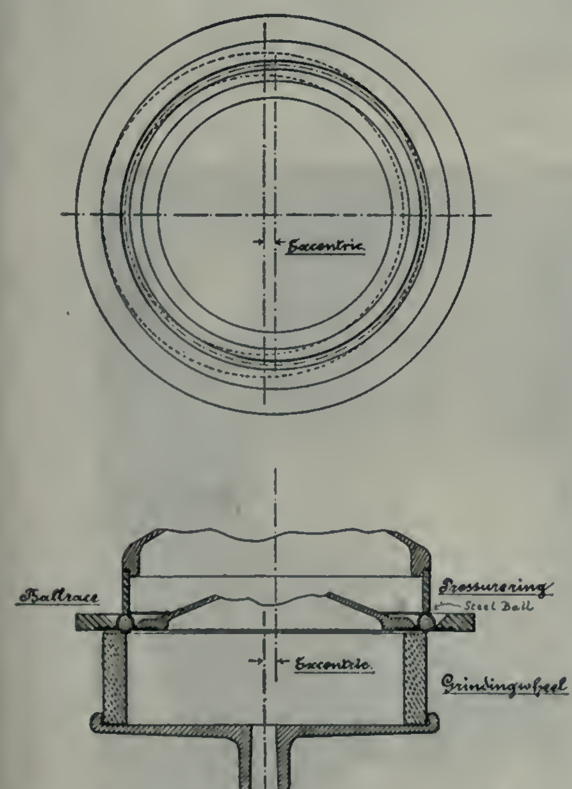
If we go back into history a hundred years, and compare that time with the present, it will give us some idea of what the world will be like in a hundred years from now. It must be so, for one of the immutable laws of nature is motion, and there must be no quiescence. So it is, then, that as conditions on this planet improve, there must be a like development along economical and mechanical lines.

It is in the mechanical world that the greatest progress has been made in an effort to keep pace with modern requirements, which are focused in a demand for efficiency coupled with economy. So it is readily seen that the elimination of friction is a most potent factor towards higher efficiency. The necessity for obtaining the greatest amount of power from the energy expended, and applying it to the work in hand, has forced the mechanical world to introduce and develop machinery which will reduce or eliminate friction, and this is where we come to the subject of this article—the manufacture of frictionless bearings.

A Growing Industry.

Frictionless bearings first entered the mechanical world as a staple product about twenty-five years ago, although, for years before, they had been used in a more or less experimental way for various purposes. The possibilities of frictionless bearings were first disclosed when they were used in the manufacture of the bicycle, now there is scarcely a piece of machinery made without having frictionless bearings as component parts. The sliding doors in your home, the street car, train, or automobile which carries you to your office, the swivel chair upon which you sit and the typewriter you operate, are but a few of the thousands of things which contain ball or roller bearings, and they are all there for the same purpose—to eliminate friction and to gain efficiency.

In order to obtain a general idea of the methods and processes used in the manufacture of frictionless bearings,



THE LOWER SKETCH SHOWS THE PRINCIPLE OF THE BALL-GRINDING MACHINE; THE SKETCH ABOVE SHOWS THE ECCENTRIC MOVEMENT OF THE GRINDING WHEEL.

FACING BRONZE BALL CAGES ON A BLANCHARD HIGH-POWER SURFACER.

*"Abrasive Age," Carborundum Co., Niagara Falls, N.Y.

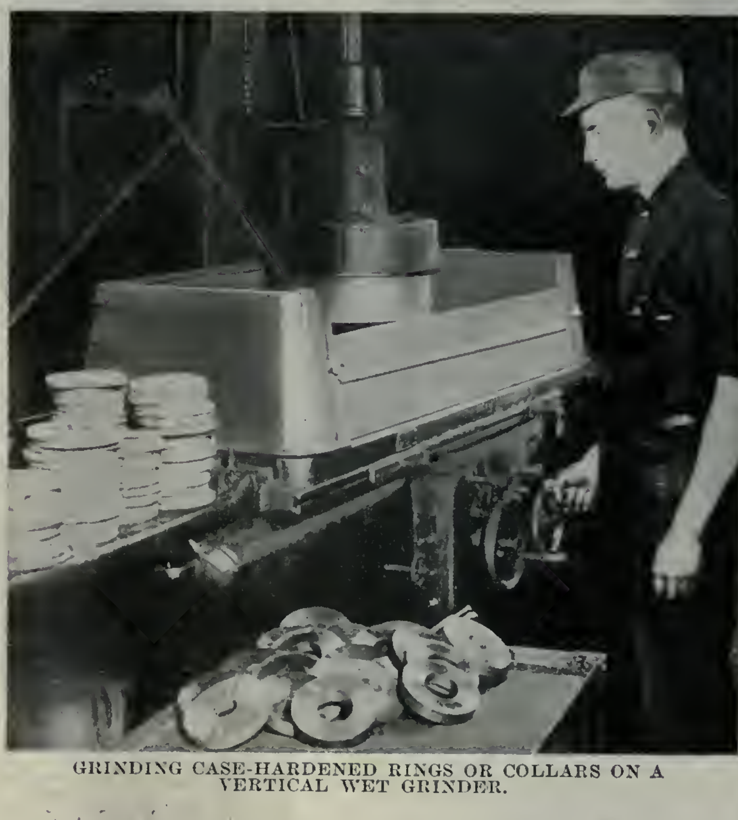
the writer recently visited several of the most up-to-date shops in the country and was enabled, through the courtesy of those in charge, to obtain some interesting data. Formerly, there was a great deal of secrecy exercised in connection with the manufacture of ball bearings, but this secretiveness is gradually passing away as more and more the importance of co-operation is being realized. In this article, we shall describe in a brief, but concise way the different types of bearings made, the manufacture of the steel balls used in ball bearings, the rollers for roller bearings, and the bearings themselves, paying particular attention to the most important operation met with—that of grinding.

GRINDING A CASE HARDENED SLEEVE ON A LANDIS UNIVERSAL GRINDER.

Types of Bearings.

There are two general types of bearings in use, familiar to every worker in the mechanical world, namely, ball and roller bearings. The ball bearing, which gives a point contact, is used where the load to be sustained is not very great. The roller bearing, with its lineal contacts, is used for sustaining very heavy loads. Ball bearings are made in two general types, namely—"radial," where the balls travel between the outer and inner circumference of two grooved rings or raceways, and "thrust," where the balls travel between two grooved or ungrooved discs or plates. The balls are contained in a brass, bronze, or steel cage, and these different parts, the balls, cage, and raceways, constitute the members of a ball bearing.

Roller bearings consist of a series of rollers contained in a cage or sleeve and a thin band of steel called the separator, which keeps the rollers from touching each other, thus reducing the possibility of friction to a minimum. These bearings are much easier to manufacture than the ball bearings, owing to the ease with which all parts can be handled. The "thrust" roller bearing consists of a series of rollers running between two grooved or ungrooved steel collars, and is designed to relieve heavy side pressure at not too great a speed. The rapid growth in the manufacture of frictionless bearings has brought forth many new types for special purposes, but, in every case, the principle is the same, the object point being the elimination of friction so as to ensure speed, long wear, and durability.



GRINDING CASE-HARDENED RINGS OR COLLARS ON A VERTICAL WET GRINDER.

Making the Steel Balls.

The highly polished steel balls of marvelous accuracy are easily the most important part of a bearing, and before they reach such a desirable state of perfection they have to pass through a number of processes, each carried out with the same exactness and attention to detail. The first process, of course, is the selection of the steel from which the balls are forged. After forging, they are cut and trimmed, rough ground, hardened, smooth ground, lapped, polished, and finally graded. We will describe each of these processes in order, with particular attention to the part of the grinder in the evolution of the steel ball.

Selecting the Steel.

It is very important in the manufacture of the balls that the very best steel for the purpose be secured. Formerly, chrome steel was used extensively as it was found to be fine grained and very hard, but tests showed that it deteriorated more rapidly than ordinary steel, and most of the manufacturers are now using carbon and alloy steel, which answers the requirements satisfactorily. As it arrives at the factory from the mill, the steel is in bundles of round rods of various lengths and diameter. These are sorted, and then placed in convenient racks ready for use. The steel rods are always chosen a little under the size of the ball to be made, so that there will be no loss in forging. In swedging, or forging, the stock upsets to full size.

EVOLUTION OF A STEEL BALL.
(A) shows the string of balls as they leave the forging machine; (B) shows appearance of ball after being hardened; (C) is the ball after rough grinding; (D) shows a smooth ground ball, and (E) is the finished or polished ball; (F) shows sections of balls fractured under the hydraulic press to test for grain and strength.

The Forging Process.

The most common method used in forging the balls is what is called string forging. Rods of steel about six feet in length are taken and fed into a special machine having hydraulic presses and dies, and fitted with a furnace-heating attachment. The rods travel slowly through the heat flame until they are almost white hot, when they pass into the dies under the hammers, and are forged into spherical shape.

Those machines for making the very small balls have an automatic cutting attachment, which cuts the balls from the string as fast as they are forged. In this manner, balls are forged and cut at the rate of 150 per minute. The larger-sized balls, from ¼ to 3 inches in diameter, or even larger, must be forged on a trip or drop hammer, then the flash is trimmed on a trimming press, which consists of a series of punches which force the balls through steel plates or dies having holes the same diameter as the balls. As the machine is working, the balls drop individually into a receptacle placed underneath, and are then taken to the grinding room for their first or rough grinding.

Rough Grinding.

The main purpose of the rough grinding is to remove the scale or decarbonized shell surface which the forging produces. During recent years, the machines used for this purpose have been greatly improved, and while the machines in some shops have special features which distinguish them from others, yet there is not a great deal of difference in the principle. It is readily understood that accuracy in this important operation is absolutely essential. the balls as they leave the forging machine being but a few thousandths of an inch over size.

In the ball-making plant of the Smith Premier works at Syracuse, N. Y., where all the balls used in the type lever bearings and carriage bearings of this well-known typewriter are made, the writer obtained his first insight into the manufacture of steel balls. This plant is up-to-date in every respect, and is in charge of some of the best experts in ball making in the country. Here, balls ranging in size from 3-32 of an inch up to 5-32 of an inch are made. Another plant in Syracuse which is equipped with the most modern types of ball-grinding machines, containing ex-

GRINDING OUT BALL RACEWAYS ON A DRY RADIAL GRINDER.

clusive features introduced by the firm itself, is that of the C. I. Lipe Co., also in charge of ball-making experts. At this plant, balls from 3-32 of an inch in diameter up to four or even five inches in diameter, are made.

In addition to manufacturing the ordinary steel ball, the Shatz Manufacturing Co., at Poughkeepsie, N.Y., also make hollow balls for bearings, which are in great demand where bearings for light machinery are required. These balls are pressed from steel, brass, copper, bronze, and monel metal, in halves, and then welded together by electricity in special machines, and it is claimed they are just as serviceable as the solid balls. After welding, these balls go through precisely the same processes as followed out in producing the solid ball.

The Grinding Machines.

Almost all the ball-grinding machines are of the upright spindle type, the accompanying sketch showing the principle used. The balls are located in a race consisting of two hardened steel rings made up of segments, so as to allow the balls to be touched by the face of the grinding wheel. Above the ball circle is located a revolving pressure ring, which travels in an opposite direction to the ball raceway. The grinding wheel is placed eccentric to the race, so that when the balls touch the inner edge of the grinding ring, on the one side, the balls on the opposite side are being ground on the outside edge of the wheel. This gives the balls a continual rolling motion, and insures a perfect sphere in grinding.

It is most important that all the balls in the circle touch the surface of the grinding ring, and only a slight pressure is needed to grind them. Another important point is that the eccentric location of the ball race to the grinding wheel has to be half the thickness of the grinding wheel or ring. For instance, if the grinding wheel or ring used is 12 inches in diameter and 2 inches thick, the diameter of the ball race has to be 10 inches, and the centre distance of the ball race to the centre of the face of the grinding wheel is 2 inches.

Owing to the fact that the machines for grinding must be absolutely accurate in every detail, they can be made only by an expert having years of experience in the manufacture of steel balls. A machine poorly designed and constructed could never grind steel balls to accurate roundness, but a well-designed and constructed machine will rough grind balls to a limit of accuracy of less than a half-thousandth of an inch.

Of equal importance to the good design of the grinding machine is the grinding wheel itself, which must cut clean and fast, hold its shape, and show long life. At the C. I. Lipe Co's. plant in Syracuse, special tests were recently made; on one of which 52 balls ¾ inch in diameter were ground in 20 minutes, removing .030 of stock, by an Aloxite wheel, 14 inches diameter, 4 inches thick, with 12 inch arbor hole, and 30 grit.

After being rough ground, the steel balls then receive a special heat treatment in which each ball is subjected to exactly the same treatment during the same period of time and at the same temperature. This is carried out automatically in special furnaces with the degree of heat constantly indicated and recorded by means of pyrometers.

Uniform treatment is the most important factor in the manufacture of high-grade steel balls. The balls are plunged into a hardening fluid as they are ejected automatically from the furnace through a closed channel, to prevent them coming in contact with the cool air. This channel is in the form of a spiral, and by the time the balls drop into the hardening fluid, they are in a sufficiently cooled condition.

The balls after being hardened are then tested to determine the condition of the grain and their resistance to crushing loads. A ball is selected from a batch and fractured under a hydraulic press, the pieces being closely examined by experts to see if there are any defects.

It is not generally known that a fairly high-grade steel ball can be produced from low carbon steel, such as cold rolled steel. In order to obtain good results, however, the heat treatment must be given careful attention. The process is as follows: The balls after rough grinding are carefully packed in hydrocarbonated bone or other good carbonaceous material, and placed in a cast-steel pot; first a layer of bone and then a layer of balls, until the pot is full. It is then carefully luted with fire clay.

The boxes are then placed in the carbonizing furnace with a uniform circulating heat on all sides. The heat is gradually raised to 1,550 degrees Fahrenheit, and held at that temperature by the use of pyrometers for sufficient length of time to secure deep penetration. The pots are then removed from the furnace and allowed to cool, after which the balls are reheated to 1,500 degrees and plunged into running cold water. From this point, the balls receive the same grinding treatment as the balls made of alloy or carbon steel. It may be stated here that the carbonized ball in many cases lasts longer than the so-called higher grades.

Smooth Grinding.

The next process is that of smooth grinding the balls down to about one and one-half thousandths above the exact size. This is done on another special machine having a very fine grit grinding wheel, on the same principle, however, as the rough grinder. In this machine, the balls receive a very smooth surface, and are less than .0002 of an inch out of round. The life of a grinding wheel in these machines is extraordinarily long.

In the Smith Premier works, a wheel $11\frac{1}{2}$ inches in diameter, 3 inches thick, $6\frac{1}{2}$ inch arbor hole in 70 grit is being used successfully for smooth grinding balls 3-32 of an inch in diameter. Two hundred of these balls are ground at a time, and, with two machines, one operator can grind 70,000 in a working day of nine hours.

The Lapping Process.

The final grinding operation is that of lapping, and this is done on special machines where the balls receive the smoothest surface and a perfect roundness. The principle of construction is the same as the rough and smooth grinders, except that in place of the grinding wheel or disc, a plain steel disc is used. Thick black oil is run into the ball raceway and the abrasive generally used is of 120 grit or finer. The lapping machine operator has to be constantly on the alert with his micrometer, and know exactly how long to run the machine in order to round the balls true to size, and the abrasive grain must be absolutely uniform in its cutting qualities.

Polishing the Balls.

The final operation is that of polishing the balls in a barrel-shaped machine, in which the balls are tumbled for a certain length of time. This gives them that beautiful mirror-like finish, and after being sorted and inspected they are ready for assembling in the bearings.

How the Rollers are Made.

The rollers for the roller bearings go through processes similar to those used in making the steel ball, except that the rollers are ground on an ordinary grinding machine. These rollers are received in the form of alloy steel forgings and after being hardened by packing in bone for twenty hours, they are ground all over. The first grinding is done on a Norton 6 x 32 plain cylindrical grinder, and they are then ground at the sides on a Blanchard wet vertical grinder. For the latter operation, the rollers are held in a special cage or jig carrying forty rollers at a time, which is then attached to a revolving chuck. The amount of stock to be removed is between .010 and .012, and with an Aloxite wheel, 16 inches in diameter, $1\frac{1}{2}$-inch wall, 12-

inch arbor hole, in 80 grit, 400 of these rollers are ground in a single day.

Ball and Roller Bearings.

We will now describe the various processes used in the manufacture of the bearings themselves. The material for the outer sleeves or box rings arrive at the factory in the form of drawn tubes of nickel steel from eighteen to twenty five point in various sizes. The inner rings and collars come in the form of separate weldless steel forgings. They are machined on automatic lathes, sufficient stock being left for grinding. Collars for thrust bearings are usually blanked out of nickel steel, and these, with the bronze or brass cages, also come in a variety of sizes.

Hardening Treatment.

The next process is that of carbonizing or case-hardening, and this also must be very carefully carried out if satisfactory results are to be obtained. Gas or oil-heated furnaces of the latest type are used, equipped with pyrometers, by which a uniform degree of heat is maintained. The hardening process consists of packing the rings or collars in iron crucibles, surrounded and separated by bone packing. These are subjected to a heat of 1,650 degrees Fahrenheit for a period of from fourteen to twenty hours, according to the depth of hardening required, and the thickness and diameter of the work. The usual depth of hardening is 3-32 of an inch. After being hardened, they are ready for the grinding operation.

At the plant of the Railway Roller Bearing Co., Syracuse, N. Y., the outer rings are face ground on a Blanchard vertical grinder, the work being held on a revolving magnetic chuck. The machine is equipped with an Aloxite wheel 16 inches in diameter, 1½ inches thick, 5-inch arbor hole in 40 grit. The amount of stock to be removed is .008, and the wheel is run at a speed of 1,000 r.p.m., the work-table speed being 13 r.p.m. Figures on the number of collars ground per hour or day were not available.

The outer sleeves, which contain the cage and raceways, are ground on a Bath Universal grinder, the work being clamped in position on a steel face plate. For this grinding, Aloxite wheels 3½ inches in diameter, 1 inch thick, ¾-inch arbor hole, in 40 grit, are used. The amount of stock removed is .015 and the wheels give every satisfaction because they cut clean and fast, and do not glaze.

The inner sleeves are of nickel steel, case hardened. After being machined to a near size, they are ground on the outside, inside, and on both ends on a Bath duplex grinder. A sleeve having an inside diameter of 4 inches and 12 inches long, and with .015 stock to be removed, is successfully ground to a desirable finish with a wheel 3½ inches in diameter, 1 inch thick, ¾-inch arbor hole, 40 grit in 30 minutes. Grinding figures on sleeves of lesser size were not available.

Thrust Bearings.

It is essential that the collars for thrust bearings have both surfaces well finished and in the same plane. These bearings are made in all sizes from less than ½ inch, up to 12 inches in diameter, and for special purposes even larger than that. When taking thrust both ways, there is, of course, a double case of balls or rollers. The grooved collars contain a groove the radius of which is slightly larger than the diameter of the balls, the one great advantage of the grooved bearings being that they will take care of a much greater load than the plain bearings. The manufacture of roller bearings is not so difficult because all parts, including washers, cages, and rollers, can be easily handled and rapidly ground. Roller bearings with their lineal contact will sustain a load from four to five times heavier than a ball bearing of the same diameter.

In grinding bronze cages, a number of these are placed on a revolving chuck in a vertical grinder and all ground in one operation. For this purpose a carborundum wheel 16 inches in diameter, 1½ inches thick, 13½-inch arbor hole in 241 grit, has been found to give every satisfaction. The cages are roughed with the work-table reading 44 r.p.m. From 24 to 35 of these cages are ground to a desirable finish in a single hour.

Steel collars are ground in the same manner as the bronze cages except that instead of using a Carborundum wheel, Aloxite is used. A test was made recently in grinding collars 2⅝ inches in diameter, 1 15-16 inch hole, when a wheel 12 inches in diameter, 4 inches thick, 8⅜-inch arbor hole in 40 grit ground 50 of these collars, surfacing both sides to a desirable finish in 19 minutes, with a wheel loss of but 1-32 inch.

On a vertical wet grinder, a cup wheel 8 inches in diameter, 3 inches thick, 4-inch arbor hole with a ½-inch wall and back in 403 grit, was grinding case-hardened steel collars 2⅝ inches in diameter, 1 15-16 inch hole at the rate of forty-nine in 15 minutes. Both sides of the collars were ground, the wheel loss being 1-30 of an inch.

An interesting operation is that of grinding out the grooves or raceways in steel collars. First of all the groove is machined out, leaving a few thousandths of an inch to be removed by the grinder. Two hundred raceways in 6-inch diameter collars with a 4½-inch hole, were ground to a desirable finish with a cup wheel 4 inches thick, 1-inch arbor hole in 60 grit. The wheel was run at a speed of 3,128 r.p.m. on a Landis grinder. Raceways are also ground on the Brown and Sharp annular or radius grinder, which is specially adapted for medium and large work and insures increased production. For instance, 9-inch steel collars, ⅞ of an inch wide are ground with a wheel 4 inches in diameter, 5-16 of an inch thick, ⅝-inch arbor hole, in 60 grit. The wheel speed is 9,000 r.p.m., and the work is ground rapidly and to a good finish.

At the plant of the Bantam-Anti-Friction Co., Bantam, Conn., the grinding equipment is most up-to-date, the very best machinery being insisted upon for turning out these well-known bearings. Here, raceways of ¾-inch radius in 6-inch steel collars are ground with a wheel 3 inches in diameter, ¼-inch thick, ⅝-inch arbor hole in 80 grit, removing .008 stock. For smaller bearings of the radial type, containing 3½ per cent. nickel steel, a wheel 1 inch in diameter, 3-16 inch thick, 3-16 inch arbor hole in 60 grit is found to give an excellent finish. On some of the stock ground on a Heald wet grinder, a wheel 2 inches in diameter, ⅜ inch thick, ⅜-inch arbor hole in 60 grit was found to be the best ever tried for grinding raceways. This wheel increased the production 150 raceways per day.

BENDING CAST IRON PIPES.

AN interesting account is given in the Engineering Record of a method of bending cast iron pipes carried out on a pipe-line from the Guayabo River to the town of Preston, in Cuba. The place where the curved pipes were required was a remote one, and as, through some oversight, straight pipes had been delivered instead of curved ones, it was decided to bend these, if possible, rather than delay the work until other pipes could be cast and delivered. The curves to which the pipes had to be bent varied, the shortest being 50 ft.

A cradle of old rails was first constructed, having the desired amount of curvature, and on this the pipes were laid, about one foot at each end projecting beyond the cradle. A fire of hard wood was then built up round the pipes, six or eight pipes being treated at one time. In 1½ hour to 2 hours after starting the fires, the pipes were hot enough to bend, and they settled down from their own weight on to the cradle prepared for them. The particular pipes treated were 10 in. diameter, the thickness of the shell being 9-16 in.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

HARDENING AND TEMPERING.

By Frank Walker.

WHEN hardening very thin articles of carbon steel, such as safety razor blades, small slitting saws, or special shear blades, great difficulty will be experienced in order to prevent warping if they are quenched in water. Water is not an indispensible medium for hardening, it only being necessary that the article, when heated to the right temperature for hardening, be suddenly cooled, in order to set or trap the carbon in its changed or hardening state. For thin, flat articles, pressure on a cold surface will be found to act as effectively for the purpose as quenching in water.

Apparatus and Process.

The simple apparatus shown in the sketch, Fig. 1, will be found to fulfill all the requirements for the class of work. It consists of two parts, the block which has a water cooled face as shown, and the pressure plate which has a handle by which it is pressed down upon the work. The faces of both must be machined to a plain surface.

The article to be hardened should be heated on a flat plate placed over the fire, and, when at the proper heat be transferred as quickly as possible to the block, the plate being instantly pressed down upon it, and held firmly as long as one may count ten, for an article 1-64-inch thick. This will be found to harden the article quite as efficiently as quenching, and without a possible chance of its warping. This process may be employed for articles up to 1-16-inch thick, but for those 1-64-inch thick, it will be found better to keep the faces of the block and plate smeared with a thin coating of oil.

Drawing the Temper.

When drawing the temper, the articles should be stacked together like a pack of cards in convenient quantities, and cramped between two steel plates, which should be faced true and polished. Figs. 2 and 3 show the method of holding square or round articles, the projecting shank being for convenience of holding them by means of tongs. They should be heated in a muffle—a piece of 6-inch wrought-iron pipe placed on a smith's forge, and the fire well banked up round it, makes a very good substitute, heating them slowly and turning frequently until the desired temper color shows on the polished surface of the cramp plates. Fix afterwards in the usual manner by quenching in cold water. The cramps should be cleaned and re-polished after each operation.

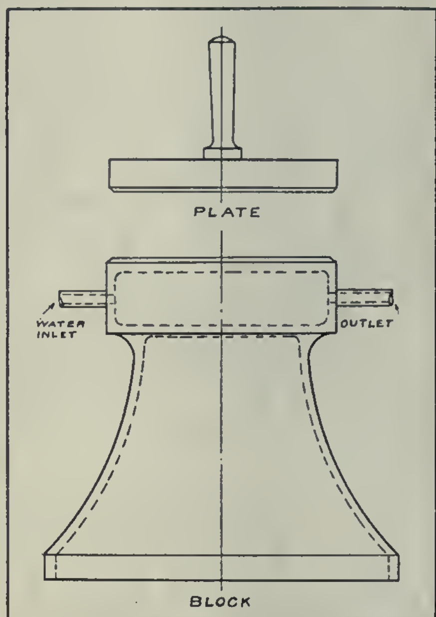


FIG. 1. HARDENING BLOCK AND PLATE

Articles as thin as 0.004 inch may be successfully hardened and tempered with this method by a quick operator.

TWO QUICK REPAIR JOBS.

By J. H. W.

ON A recent voyage of the twin screw Allan Liner "Hesperian" from Glasgow to Montreal the port engine failed on the second day out, and investigation showed that the low pressure crank had broken in the main after bearing. The break took the form of a spiral, and extended about three-quarters way round the shaft. The voyage was continued with the starboard engine only, and Montreal was reached without further incident two days behind schedule. A message had been dispatched from Father Point to the Hall Engineering Works, Montreal, asking them to be prepared to commence work on the repair immediately the vessel docked. Mr. Thomas Hall, managing director, and his chief assistant, Mr. W. Fletcher, personally supervised the work, which consisted in replacing the broken crank with a spare one carried on board.

At first sight this does not seem to be a very lengthy job, but it must be remembered that it involved the removal of the engine room gratings as well as a large amount of auxiliary piping. The broken crank had to be uncoupled, the bearings taken out and the connecting rod removed. The crank, which weighed 8 tons, was then lifted out.

The spare crank was being carried upended in a corner of the engine room, and being in a rather awkward position, it had to be very carefully handled on account of its proximity to a fan engine and a Weir pump. However, it was successfully raised by means of blocks and jacks and placed in position in the bearings. It was then lined up, the holes for the coupling bolts reamed out, and new bolts fitted. After the crank had been coupled up to its neighbor, the connecting rod was replaced and adjusted, and all auxiliary piping, etc., put back in position. Work was carried on day and night, about twenty men being employed. The Hesperian docked on Thursday morning, July 17, and the repairs were completed by the following Sunday night. It will generally be admitted that this constitutes a remarkably good per-

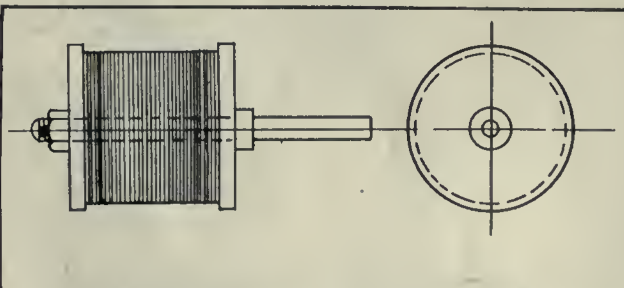


FIG. 3. METHOD OF CRAMPING SLITTING SAWS.

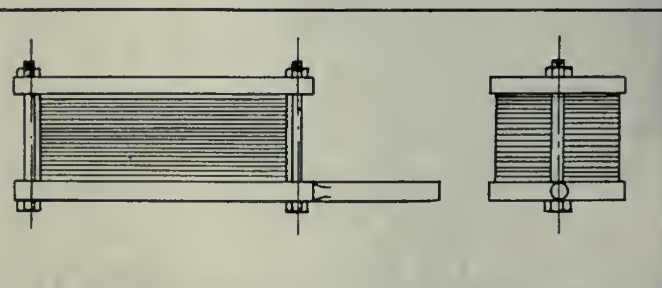


FIG. 2. METHOD OF CRAMPING SHEAR BLADES.

formance, and one that reflects credit on the Hall Engineering Works.

S.S. Comet.

This company also recently effected a very quick repair to the S.S. Comet, of New York. The Comet is a new tank steamer belonging to the Standard Oil Company. On July 22 last she arrived at Montreal with all four blades of her sectional bronze propeller badly bent through striking a dock wall. Repairs were carried out in the short space of ten hours without putting the vessel into dry dock.

She was tipped by filling her fore peak and forward tanks until the propeller was out of the water. Three of the blades were then removed and taken ashore to the shops of the Hall Engineering Works to be straightened. The fourth was left on the boss, it being found feasible to straighten it in position by means of hydraulic jacks and hammers. Notwithstanding the fact that the blades were very much bent the whole of the work was completed between 10 a.m. and 8 p.m. of one day.

CIRCULAR BROACHING FIXTURE.

By A. L. Monrad.

IN many shops it is found to be quite a problem to construct a fixture for a certain class of work, especially where nothing of its kind has ever been previously attempted. When laying out fundamental outlines of a certain fixture, one often stumbles across something accidentally, which, when worked out, proves exactly what is wanted. In the model shown by Fig. 1 a circular cut below the centre was attempted by different toolmakers without success. They first milled down as far as possible with a T cutter, and tried to wiggle it out with a hand tool. That worked all right, but was a very expensive method. The writer happened to be around while this operation was being performed, and, after some few inquiries, suggested the design shown in Fig. 2.

As only 10,000 of these blocks were to be manufactured, the expense of the tool had to be considered, and, therefore, it was decided to place the fixture in a universal milling machine until such time as the blocks, Fig. 1, would be in more demand to warrant a more elaborate equipment.

Detail of Fixture.

A machinery steel block (A), shown in Fig. 2, was machined all over, and a 1/4-inch hole bored to one side of its centre. The top was surfaced off in the same setting. The bottom of the hole was counterbored to a turning fit for a 3/8-inch thick washer (B), and on top is located a tool steel vise plate (C), which is made a good turning fit in the hole of the block. A shoulder screw (D) tightens up firmly between the washer and the bottom of the vise plate. A drill rod handle (E) was driven in on one side of vise plate, with a stop (F) and stop pins (G) on the other end.

On top of the plate is located the vise (H), which is solid with the plate, and is locked with two screws (I). A stop pin hole (J) was drilled part way into the plate. This locates the work in position. On account of the model block being made in different heights an adjusting block, (K) is placed between the work and the stop screws (I). When the work enters, the pin (J) is so adjusted that the face of the work just bears against the wall, and does not wiggle to one side or the other before being clamped. The adjusting block is held stationary with a cap screw (L). A swinging clamp (M) is placed on top of the work, and is held with a knurled screw (N). When unloosening the work, it swings against the stop pin (0).

The fixture is placed on a cast iron plate (P) planed parallel and held securely with two straps (Q) and bolts. The whole attachment is located on the centre line of the work on a universal milling machine with two machine screws (R) in the T grooves of the milling table. A broaching cutter (S) is placed in a milling machine collet and located parallel with table. This cutter is made the same width as the previous T cut, and the cutting edge on both sides is a little concaved, thereby making it free cutting. After being properly adjusted for height and centre, the spindle of the milling machine is locked with a wooden wedge between the bottom of the cone pulley, and the body of machine to prevent the cutter from turning around. Stops are set on each side of the milling table.

To operate the fixture, place the work on the locating pin, turn strap over the work and run down the knurled screw which holds it firmly. Turn handle (E) to stop pins on each side and at same time feed in to the required depth. This attachment can be made to mani-

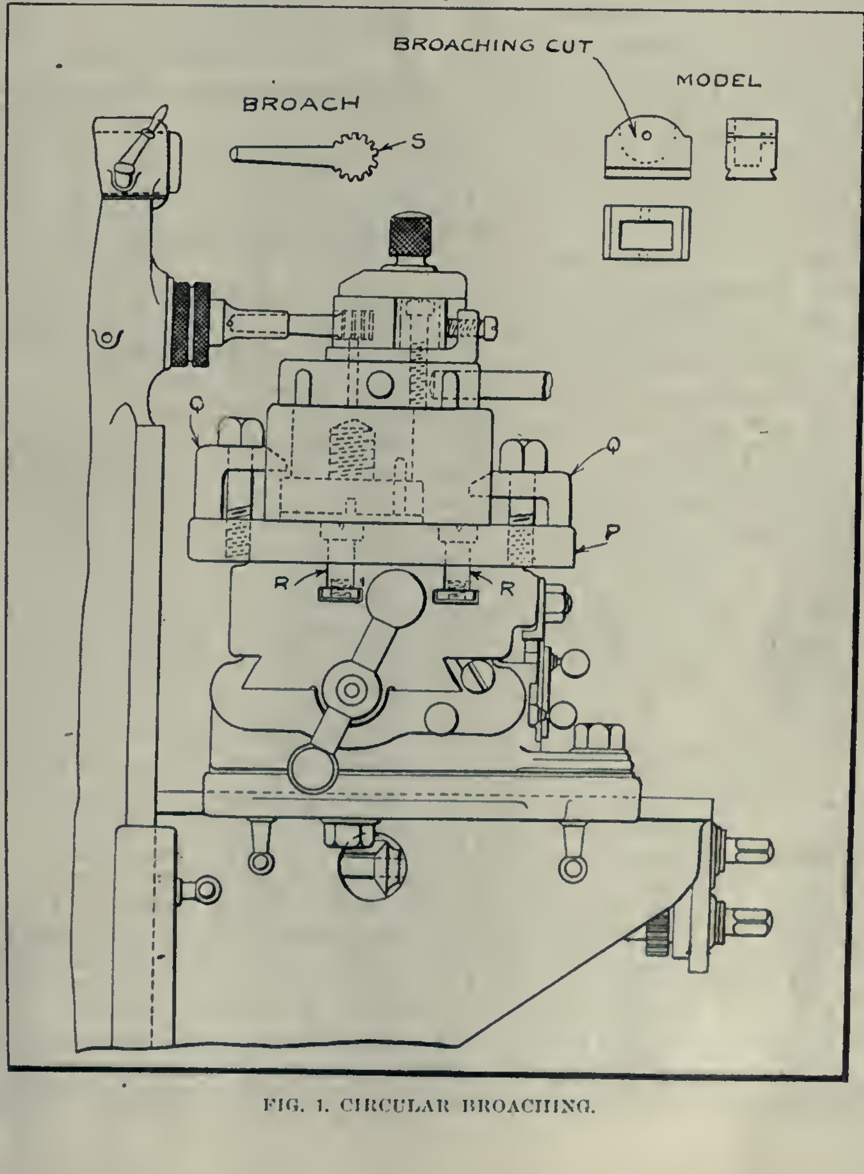


FIG. 1. CIRCULAR BROACHING.

pulate the work a great deal faster by placing a cam motion on the handle (E), thereby operating the whole fixture automatically.

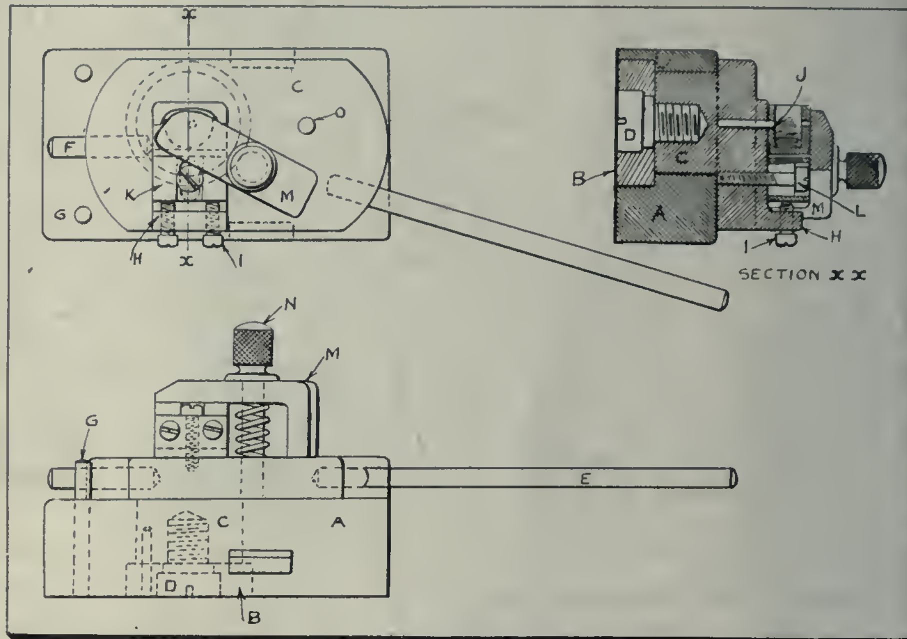


FIG. 2. CIRCULAR BROACHING.

BABBITTING EXPERIENCE.

. By Jas. E. McCormack.

LAST season I had a couple of solid bearings to re-babbitt, and had no cores of the proper size at hand. I had once seen the same shaft lined-up in position bare, and babbitted as it was; then a couple of hours were spent pounding the bearings off, and removing with a half round file enough of the metal to allow the shaft to revolve freely.

Detail of Method Adopted.

I decided to try some other method, and after unbolting the bearings, I blocked the shaft up, slid the bearings off, and, of course, removed all the old babbitt. I then cut a strip of paper a little wider than the bearings were long, and put two laps of this around the shaft at each bearing; cementing the edges down tight, and turning the shaft to put these cemented edges underneath, so that the flowing metal would not loosen up the joint and spoil the run. To make doubly sure that the paper would keep its place, I wrapped it with small cord. Starting just inside one edge of the bearing surface with the centre of the string, I made one straight lap around the shaft, then wound spirally to near the other edge of the bearing by lapping with both ends simultaneously, finishing with one straight lap and tying the ends together. When this was done, I had made about one lap with each hand for every inch the bearing was long.

In addition to holding the paper in place, this formed oil grooves in the metal to assist in lubrication, care being taken that the cord used was not so coarse as to make the grooves deep enough to materially weaken the lining, and also that the grooves did not extend to the outside edge of the bearing, and thus afford a spillway for the lubricant to waste

After the pouring was finished, a lever passed through the spokes of the pulley forced the shaft to turn, and after the second revolution made in this manner, the holding bolts were removed, and the bearings pulled off by hand. The paper and as much cord as would come were taken out, and the bearings replaced. The latter have given entire satisfaction and the work was accomplished in much less time and with less labor than would have been required to loosen them with a sledge and ease them with a file if the paper had not been used. When oil is the lubricant applied, a finer cord should be used than if the lubricant is to be cup grease.

Another Example.

In another machine there was a bearing which had given trouble from the first day it was operated, this trouble being caused by the designer attempting to make two bearings do the duty of three. There should have been a pedestal alongside of the machine, with a third bearing to carry part of the strain of the belt, but the arbor was made too short to allow of this, thereby throwing upon this troublesome bearing an excessive pressure and friction.

The arbor was 2 7-16 in. diameter, and ran 1,800 revolutions per minute in bearings six inches long. I finally secured a cool running bearing as follows: I began by digging out all the babbitt, and chiselling in the bottom of the bearing a chamber about 7/8 in. wide, 5/8 in. deep, 3½ in. long on the bottom and 5 inches long at the top, the ends sloping up gradually to a point. I next cut a stick to fit this chamber and come even with the top of the iron, but afterwards whittled it on the two sides to bring it to ½ in. wide instead of 7/8 in., and with a cord I bound this to the under side of the arbor and directly over the chamber, having first carefully wrapped the arbor with two thicknesses of paper and cemented the edges down.

With pieces of old babbitt I blocked the arbor in position, puttied and poured the bottom half of the bearing, then bolted the cap in place with liners inserted, and puttied and poured it also. When cool I removed the cap, raised the arbor, took out the cord, stick, and paper, smoothed up the reservoir (where the stick had been), eased off the edges of the bearing, bored out the grease cup hole, cleaned the parts, filled the reservoir with cup grease, and re-assembled the parts. I next filled the grease cup, and, after forcing some of the grease through onto the arbor, I started the machine. The bearing did not heat, and it has not given any trouble since, nor has it required any more than one-third the amount of lubricant that was formerly necessary.

As the reservoir itself was seamless, and as the arbor had been blocked in position with pieces of babbitt, and the new pouring had flowed around this perfectly, there was no chance for lubricant to waste by oozing through the babbitt, and out between it and the frame of the machine. The grooves left in the metal by the string formed passage ways for the lubricant to reach every part of the journal.

A little resin in the babbitt causes it to flow better, and is good to use when doing babbitting in an unheated building in winter weather. Asbestos mixed with cylinder oil makes an excellent substitute for putty when babbitting, and it has the advantage that it will keep for months, ready for use, and does not get hot like putty.

MOTOR BREAKDOWN.

By A. F. Adams.

ON Tuesday, June 24, of this year, during a severe electrical storm, which passed over the city of Vancouver, the 400 h.p. 3-phase alternating current, induction motor, in the plant of the Vancouver Ice and Cold Storage Co., which drives a 130-ton ammonia compressor, stopped after a particularly heavy peal of thunder.

When the machine stopped, the no-voltage circuit breaker went out, at the same time throwing oil out of the circuit breaker box. Smoke also was noticed around the motor, but apparently it came from the breaker box. On investigation, the fuses and all parts of the motor seemed to be uninjured, and as soon as the city turned power on the line from which we were feeding, it having been temporarily shut off, the motor was started and ran for 26 hours, showing no signs of trouble.

Development of Trouble.

We had to shut down for a couple of days while the compressor rod was being turned and the valves were being overhauled. This work being completed, the compressor was again started, but had hardly attained full speed when the insulator on the armature coils of the motor gave way in a number of places.

The rotor was left in its natural position, being held by the end bearing, while the centre bearing was slung up. The armature, including the frame, was moved straight out from the rotor on to a platform built for the purpose, after which men were at once put to work to repair the broken insulation.

Trouble Again in Evidence.

On July 3, the motor was again started up, when the insulation gave way at several more places. These having been repaired, the motor gave no further trouble. The motor is of 400 h.p., 2,200 volts, 117 amperes per terminal, 3-phase, 60 cycles, 285 r.p.m., full load speed, and was built by the Canadian Westinghouse Co., Hamilton, Ont.

Query I.

Did the lightning puncture the insulation? If so, why did the motor not show signs of trouble when it was first started after the storm?

Query II.

If lightning was the cause of the trouble, is there not some way of protecting the motor and making it safe to operate during an electrical storm?

The motor, which is loaded only to about half its rated capacity, has been in operation two years, and has never previously given a minute's trouble.

G.T.R. "SAFETY FIRST" MOVEMENT.

THE Grand Trunk Railway, adhering to the progressive policy which characterizes that system, announces the inauguration of "A Safety First" movement. Mr. Howard C. Kelley, vice-president, has issued an official circular calling the attention of the officers and employees to the "great importance of an organization for the prevention of injuries and damage to property."

Mr. George Bradshaw has been engaged as safety engineer, charged with the duty of putting the movement into effect. He will inspect the lines, terminals and shops, and confer with the various officers on matters pertaining to the safety of the travelling public and employees.

"Safety" Meetings.

The thoroughness with which the Grand Trunk is going about this important work is shown by the fact that the safety engineer, assisted by the local officers, will hold "Safety Meetings" at all important centres on the system, at which practical instruction bearing on safety will be given to employees in all departments.

Stereopticon views of unsafe and safe conditions and practices will be shown and explained, the purpose being to reach and make a lasting impression upon the mind of every employee for the benefit of safety. Committees composed of officers and employees will be organized on all divisions, terminals and in all important shops whose duties it will be to discover and correct unsafe conditions and practices.

The management of the Grand Trunk has kept in close touch with results obtained on other important systems in the United States, and having concluded, after careful consideration, that the movement has great merit, will push along its application with the greatest vigor.

"It is our purpose," remarked Vice-President Kelley a few days ago, "to extend this highly important work to every branch of the service. Safety is the first and most important consideration in railroad operation, and no effort will be spared to give to every patron and employee of this system the greatest possible protection."

North Battleford, Sask.—Recent figures from North Battleford place the assessment for 1913 at $10,034,137 as compared with $5,579,397 for 1912, giving an increase of $4,454,740, or nearly 99 per cent. It is said that within two years, at least, the city will finally have adopted the single tax system. The assessment for the present year is 100 per cent. on the land and 30 per cent. on buildings. Fully 30 per cent. of the land within the city limits is assessed on the acreage basis. The city is negotiating with the Hudson's Bay Co. for the purchase of 375 acres of land close to the present improved portion of the city, the intention being to create a park. A subway, costing $50,000, is at present being constructed across the C.N.R.

THE MECHANIC LOOKING FOR A POSITION.

By J. E. N.

HOW many mechanics have applied for a position at some plant where there was a vacancy on the staff, and for no reason they could figure out, the application would be turned down. Perhaps they had good records, and No. 1 recommendations, but it was no go. There are several things a mechanic should attend to if he desires to secure a favorable hearing, and a few hints to some of the boys may be helpful.

Serviceable Hints.

I remember reading what a prominent business man said about this matter. Said he: "If I only had a few dollars I would spend them on a neat outfit of clothes (unless I already had them) and get a clean shave, a hair cut and a general brush up before applying for a situation, for it is a mistake to imagine that any careful business man will employ a slouchy applicant." Most employers will carefully overlook a prospective employee, examine his clothes, speech and manner. If you hesitate in your answers to his questions, he will probably conclude you are without confidence in your own ability; therefore, show by appearance and manner that you have some pride, intelligence and confidence in yourself, but be careful not to be too independent as to become impertinent.

Do not ask the prospective employer's pardon for intruding upon his valuable time, or even for being so thoughtless as to be on the earth, but be courteous and straightforward without being servile.

It is a good idea to go looking for the position with the determination of making the employer certain that he needs you. Tell him that you want the opportunity to show him that you can save him money, and if you cannot do so you will cheerfully get out. It is well to remember that no one wishes to employ a failure, so do not be listless, dopey or despondent in your manner, no matter how you feel, but brace up, put on a cheerful face, and ask for the position like a man. If you are too late, ask him if he knows where a good man can get a place, and the chances are that he will put himself to some trouble to help you out if you impress him right.

Do not keep your overalls on when you go applying for a situation, thereby expecting to impress folks with the idea that you are a worker, because probably the man you wish to impress will put you down in his mind as being too lazy to clean yourself properly.

DEVELOPMENTS IN MACHINERY

A Record of New and Improved Machinery Tending Towards Higher Quality and Economical Production in the Machine Shop, Blacksmith Shop or Planing Mill.

DOUBLE SPINDLE, DIRECT CONNECTED MOTOR DRIVEN GRINDER.

THE illustration shows a Double Spindle Direct-Connected Motor Driven Disc Grinder, carrying 18 in. diameter disc wheels, which has just been developed by Charles H. Besly & Co., Chicago. It brings two grinding discs in contact with the work, grinding two parallel surfaces simultaneously, and is largely used by wrench manufacturers, brass nut manufacturers, etc.

The motors are the new pressed steel type recently developed by the Westinghouse Electric & Manufacturing Co., and which were recently described in these columns. The motors are bolted on sub-plates which are mounted on ways planed on main bed casting, and clamped in position, similar to the headstock and tailstock of a lathe. The head to the left is stationary, but the one to the right can be moved along the bed by means of gear and rack, and clamped to grind any desired length within the capacity of the machine. The motors are 5 h.p., 1,400 r.p.m., to operate on 25 cycle alternating current, and when built to operate on 60 cycle current, the machine is equipped with 20 in. diameter disc wheels, running 1,200 r.p.m. in order to get the proper abrasive speed. These machines are not built to operate on direct current circuits.

To bring the discs in contact with the work, the rotor shaft or spindle of the right hand motor has an endwise movement of one inch. This movement is actuated by lever and pinion engaging a rack cut on the outer bearing bushing. The rotor of this motor is displaced ½ in. from magnetic balance, while grinding. Careful tests show that this displacement reduces motor efficiency only 1 to 2 per cent., while maximum output remains approximately the same as when running in magnetic balance. Longitudinal movement of this sliding spindle is limited inwardly by adjustable micrometer stop screw, graduated to read to .001 in., so that work may be ground accurately to size and duplicated. The work rest, which has vertical adjustment, is supported from the slotted pad on front of bed casting, and the machine regularly has ten work rests in assorted widths from ¼ in. to 5 15-16 in.

The machine is equipped with automatically telescoping dust hood, hinged at back to give free access for changing discs, and has air tight connection at back of machine for exhausting the grindings. Provision is made so that a third wheel and rockershaft may be attached to the left end of the machine at any time. On this shaft may be mounted a suitable work table to serve this third grinding disc.

It will be noted that the motor rotors are built up directly on the grinder spindles, these spindles being of hard crucible machinery steel, and run in inserted bearing bushings of phosphor bronze.

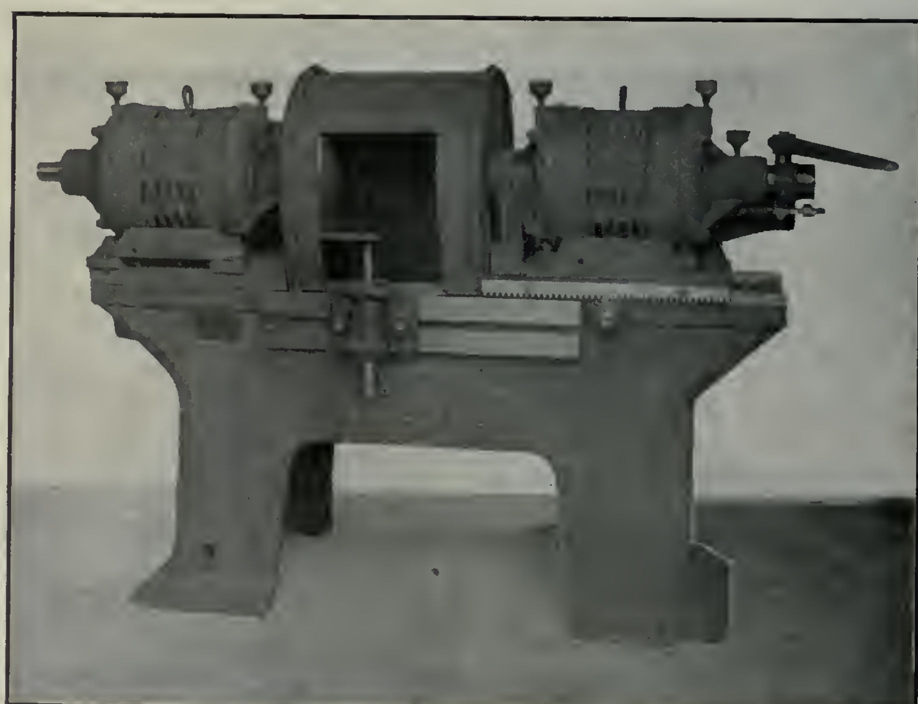
The motors are equipped with special end castings to receive the inserted bearing bushings, and end thrust of spindles is taken on hardened and ground tool steel thrust collars. The end play of spindle is controlled on outer bearing bushing by adjustable keyed collar held in place by lock nut at end of spindle.

In the right hand motor, both bearing bushings slide with the spindle and completely incase it; therefore, the spindle is well reinforced when under load, and thoroughly protected from emery dust. The spindle and thrust bearings are lubricated by solid oil from compression oil cups, oil grooves being so placed that oil is positively forced where it is needed. Movement of the solid oil is always outward, which prevents grit entering and cutting the bearings.

The geared lever feed on sliding spindle gives the operator a leverage of 20 to 1, so that he may force the machine to the limit of its driving power without undue muscular exertion. The lever is clamped to the pinion stud. This is a feature, because the lever may be clamped on this stud in just the position which makes it the handiest for the workman.

The spindles are 2 in. diameter in bearings; the height of machine to centre of spindles is 40 inches; the combined length of four bearing bushings is 31 11-16 inches; the maximum opening between disc wheels is 10 inches; the floor space of bed casting is 24 inches by 58 inches; the bed of machine under heads is 14 inches by 64 inches, and the shipping weight, 2,600 lbs.

It is very desirable that this type of disc grinder be direct connected motor driven for the reason that when belt driven it requires a very large and heavy countershaft, it being necessary to provide in the countershaft a drum pulley long enough to accommodate the full sliding adjustment in the movable head of the grinder. The countershaft regularly furnished with this size grinder when belt driven is 96 inches long, and weighs over 700 lbs. By using the mot-



DOUBLE SPINDLE DIRECT CONNECTED MOTOR DRIVEN GRINDER.

or driven machine, all this overhead work is naturally omitted.

POWERFUL HYDRAULIC FORMING PRESS.

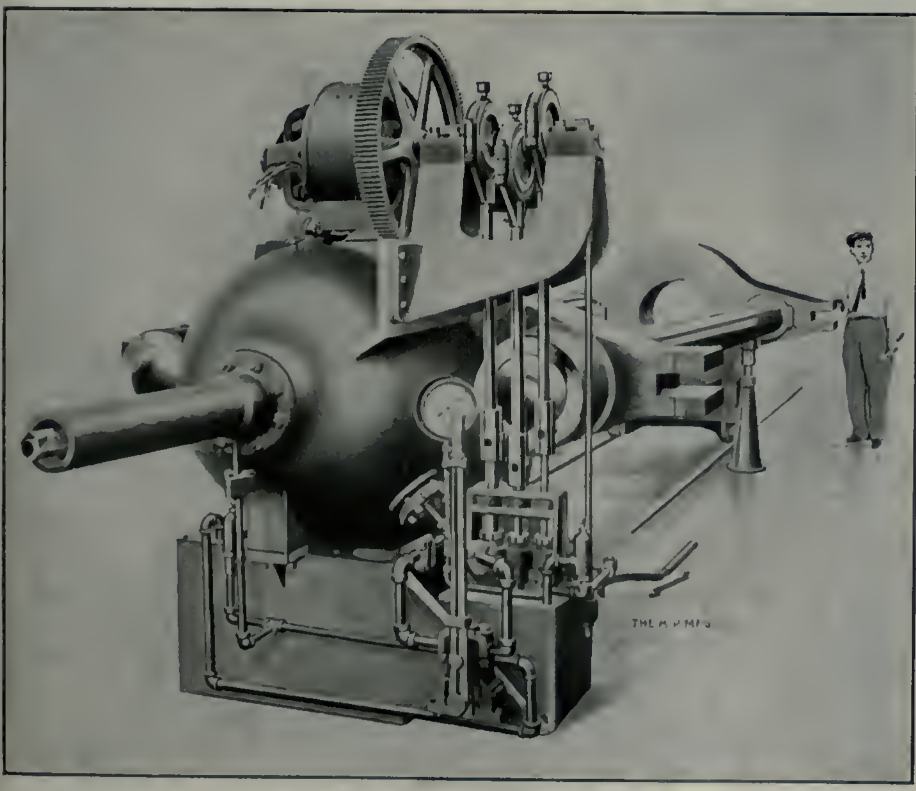
THIS powerful machine is used for general machine shop work, but was primarily designed for forcing shafts into sugar rolls for large sugar mills, being largely used for that purpose.

The press is built of selected material, the principal parts being of forged steel and open hearth steel castings. The main pressure ram works through a long and close bearing packed with a U leather packing held in place by a steel gland. The ram is returned by an auxiliary ram working through the end of the main cylinder. A direct pull is thus obtained. All parts are accessible for repacking. The press head is mounted on wheels so that the daylight or working space may be easily changed by moving the head on the rods. Strain rod spacing blocks are placed in the rods between the press head and the heads of the rods for short work. Adjustable strain rod supports are furnished for supporting the rods while changing the daylight space.

The largest diameter which can be handled between the strain rods of the 1000-ton press is 48 inches. Many shops require about 300 tons pressure for special work of such shape or size that it cannot be handled unless a greater space is provided between the rods. For this purpose, the main rods can be removed, and forged bars placed in the outer slots of both the cylinder lugs and head, and keyed in place. The press will then accommodate 84 inches between the bars.

The pump is of the triplex, direct connected, motor driven pattern mounted on the press. The pump chambers are cast en bloc of government bronze. A special type of pump control is used, which enables the operator to knock out any number of the pumps at will. The control will automatically knock out at fixed pressures without attention from the operator. The main operating valve is of the quick change, double acting type with quadrant for holding it in forward, reverse or neutral positions.

The Hydraulic Press Mfg. Co., Mount Gilead, Ohio, are builders of the press here described and illustrated.



POWERFUL HYDRAULIC FORMING PRESS.

STEEL: OVERHEATING AND BURNING.

IN a paper read at the North-East Coast Institution of Engineers and Shipbuilders, J. E. Stead, D.Sc., says:—

Overheated steel is material which has been heated to a point short of incipient fusion, and which when cold, in consequence of such treatment, has a coarse crystalline structure and is liable to break down under shock. Burnt steel is material which has been heated to a point above incipient fusion. Overheating of structural and soft steels does no permanent harm to the material, and burning is not accompanied by intercrystalline oxidation unless fissures are formed by straining the highly-heated steel. Burnt steel which has not been strained when hot, and is consequently free from fissures, if allowed to cool in air and then reheated to a proper temperature, can be worked without breaking to pieces, and, unless the material has initially been brought to a semi-liquid condition, will be equal in good properties to the same steel before burning, provided, of course, that the sulphur and phosphorus are not excessive.

Dr. Stansfield was the first to recognize that burning of steel was equivalent to partially bringing the steel back to the condition it was in when in the ingot. If the heating is carried on well above the incipient stage of fusion, liquation occurs, and a more fusible part actually liquates out of the metal, which is left in a porous state due to the presence not only of fissures but of gas bubbles. The walls of the cavities, however, are not tarnished or oxidised, and can be readily welded up after reheating and forging. To reproduce good steel from such material requires a considerable amount of work, and, even after such treatment, it cannot be so good as the original steel. The temperature occasionally applied to tool steel ingots previous to forging is, in a sense, overheating, but the subsequent forging eliminates the coarse crystalline structure produced.

ELECTRICAL EQUIPMENT FOR RAILROADS.

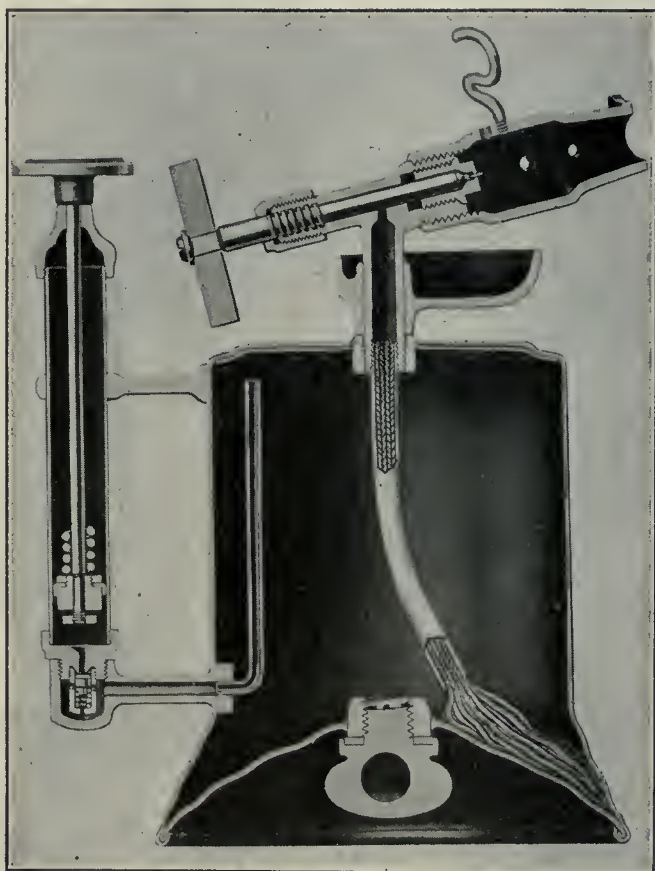
THERE is no logical reason why a railway desiring to use electrical energy should have to begin at the beginning and build a costly special plant for its service any more than there is reason why, desiring coal, it should go to great trouble and expense of acquiring and developing coal mines. It can buy electrical energy in one case and coal in the other in many instances cheaper than it can possibly generate or raise coal from a mine.

The great technical difficulty for a station supplying energy to a large railway system is that the load factor is likely to be peculiarly bad. The railway load, with its sudden peaks and low average, can be handled much more economically in a station already carrying a huge miscellaneous output in which the relatively minor variations of the railway service sink and disappear. The gain in the matter of load factor in a station operating both railway and miscellaneous load is enough in most cases to determine the economies of the question.

A UNIVERSAL BLOW TORCH.

A new gasoline blow torch has recently been placed on the market by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., which embodies a number of novel features and improvements. These improvements, it is claimed, adapt the torch for all conditions of service, and it is therefore called a Universal Blow Torch. Illustration of the torch as a cross sectional view are here shown.

The burner is made particularly heavy so that it will retain its heat and keep the torch burning in cold or windy weather, and the drip cup is made especially deep so that it will start the torch under bad weather conditions. These features, however, do not detract from the use of the torch for indoor work.


UNIVERSAL BLOW TORCH.

Another feature of the torch is the self-cleaning burner valve. The needle at the end of the valve stem cleans the hole automatically when the valve handle is turned. The valve seat need, therefore, never be injured by picking at the opening to clean it. The valve seat is a separate replaceable plug.

The handle of the valve is of fibre, and does not get hot, nor does it need a long valve stem for cooling as does an iron handle. On the other hand, it will not crack, loosen and come off as will a wooden handle. It does not char or burn.

The tank it is claimed, is of the heaviest gauge brass ever used for torch tanks, and is reinforced with an extra corrugated brass disc covering the entire inner surface of the tank pot. This insures the tank keeping its shape under very rough handling. The pump valve works in a cylindrical guide which assures perfect seating of the valve. It can be taken apart and any part replaced separately.

The illustration shows the quart size of torch. A pint size is also furnished and differs only in the shape and size of the tank.

AUTOMATIC REPLACEMENT OF ELECTRIC LAMPS.

An improved device for the automatic replacement of electric lamps for signalling is, according to the Electrical Review and Western Electrician, now being given a trial by the Pennsylvania Railway Co. If successful, some thousands will be used. In this new device, a disc holding four lamps is pivoted within the lantern, one lamp burning in focus with the signal lens; the other three lamps being in reserve. When a burn-out occurs, the bad lamp is immediately thrown out of focus, and a good lamp substituted. This practically eliminates one of the greatest troubles now being experienced, that of maintaining a lighted electric signal regardless of lamp burn-outs.

CANADA'S STEEL OUTPUT.

According to the report of the Bureau of Statistics of the American Iron and Steel Institute, 1912 was a record year in Canadian iron and steel production.

The production of all kinds of steel ingots and castings in Canada from 1908 to 1912, is given below by provinces:

	—Gross Tons—			
Provinces.	1912.	1911.	1910.	1908.
Nova Scotia ..	416,313	398,781	371,196	326,311
Ontario	417,634	378,158	359,253	178,141
Que. & B.C...	19,084	13,932	11,475	5,595
Total	853,031	790,871	741,924	509,957

The following table gives the production of all kinds of steel ingots and castings in Canada by processes from 1904 to 1912:

	Bessemer.	O.H.	Misc.	Total.
1904	42,738	106,046	...	148,784
1905	164,488	238,681	280	403,449
1906	219,791	347,778	3,320	570,889
1907	202,268	440,936	3,550	646,754
1908	108,433	401,119	405	509,957
1909	182,304	496,142	305	678,751
1910	199,570	542,354	...	741,921
1911	189,797	601,074	...	790,871
1912	207,569	645,062	400	853,031

The output of all kinds of finished rolled iron and steel in Canada in 1912, with one plant estimated, was 861,224 tons, a record production, and an increase of 79,300 tons over 1911. The details of production for four years are as follows:

	1912.	1911.	1910.	1909.
Rails	423,885	360,547	366,465	344,830
Str. shapes and wire rods ...	64,082	76,617	80,993	74,136
Plates & sheets, nail plate, merchant bars, tie-plate, bars, etc..	373,257	344,760	292,353	243,775
Total	861,224	781,924	739,811	662,741

The production of all kinds of finished rolled iron and steel in Canada in the last five years is given below by provinces, in gross tons:

Provinces.	1912.	1911.	1910.	1908.
Nova Scotia ..	337,466	336,520	310,460	261,078
Quebec	88,172	65,378	62,605	54,971
Ontario	418,346	367,768	356,645	174,158
N.B., Alta., & Man.	17,240	12,258	10,101	6,315
Total	861,224	781,924	739,811	496,517

The following table gives the production of all kinds of finished rolled iron and steel in Canada from 1895 to 1912 in gross tons. Rolled forging blooms and rolled forging billets are included for 1905 and all subsequent years. Gross tons are used:

1912....	861,224	1906....	571,742	1900....	100,690
1911....	781,924	1905....	385,826	1899....	110,642
1910....	739,811	1904....	180,038	1898....	90,303
1909....	662,731	1903....	129,516	1897....	77,021
1908....	496,517	1902....	161,485	1896....	75,043
1907....	600,179	1901....	112,007	1895....	66,402

The output of forged iron and steel by mills was 22,415 tons. Last year the cut or wire nail output was 788,190 kegs as compared with 652,861 kegs in 1911. The production of finished angles, splice bars, tie plates and fish plates was 52,157 tons.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

ARTIFICIAL LIGHTING OF IRON FOUNDRIES.

THE Annual Report of the Chief Inspector of Factories and Workshops in Great Britain, for 1912 contains a special report upon the "Artificial Lighting of Iron Foundries," by Mr. D. R. Wilson, compiled as the result of visits to forty foundries in different parts of the United Kingdom. Mr. Wilson expresses the opinion that so far as the actual carrying on of the work is concerned, the intensity of the illumination appears to be of little importance.

At the moment of pouring, ample light is derived from the molten metal itself, and the previous and subsequent processes can be and often are carried out with the aid of supplementary light obtained from portable lamps. Insufficient light is undesirable from the point of view of accidents, caused by stumbling during the passage from one part of the foundry to another, especially when handling metal, or when passing near moulding pits or parts of the foundry in which metal has been recently poured. In other words, "general" rather than "local" illumination seems to be the important matter to be considered.

General Characteristics.

From the point of view of lighting, an iron foundry possesses several characteristics which are either absent or less pronounced in other works:—

(1)—The whole of the floor space is covered with very dull and dark material. Measurements of the diffused reflecting power of this surface indicate that only about 2 to 3 per cent. of the incident light is reflected. This refers to iron foundries only, as in steel foundries a light colored sand is used, and the diffused reflecting power is about 10 per cent.

(2)—The material covering the floor is of uniform color, and there is almost complete lack of contrast throughout the room. There is, therefore, no surface to serve as a contrasting background for obstacles, which are often difficult to distinguish.

(3)—The processes involve the production of much dust, and at certain stages of the work dense smoke is evolved.

(4)—Shadows are said to be specially undesirable, probably on account of the further reduction of the illumination.

(5)—Glare is liable to result from the molten metal, and sometimes from badly shaded light sources placed too low, with the consequence that the eye is temporarily dazzled, and risk of stumbling is increased.

High Degree Illumination Necessary.

From the foregoing remarks, it will be seen that for efficient lighting the illumination in iron foundries should be high compared with other rooms. Objects of similar and very low diffused reflecting power are the more readily distinguishable, the more intense the illumination received by them, since contrast is enhanced by the increased difference in the amounts of light reflected. More efficient contrast could also be obtained, especially in small foundries, by frequent limewashing of the walls, the white surface of which would then serve as a background for the dark colored objects on the floor.

In addition to this advantage, a white wall does much to increase the actual illumination, especially with natural lighting. The walls in many foundries are already limewashed, but they are often almost black owing to the deposit of dust. The presence of smoke in any quantity greatly reduces the illumination on the floor, especially when the light sources are situated high up. This is, generally speaking, only a temporary matter, since the smoke soon makes its escape from the room, but it constitutes one more argument in favor of as intense an illumination as possible.

Dust, according to the report, has a more permanent deleterious effect in foundries where incandescent gas is the illuminant, since it is said to injure the mantles and to block the air orifices. On the other hand, it was found that incandescent gas systems are frequently adopted, and if suitable precautions are taken, such as protection of the mantles by glass shades, use of powerful units placed high, etc., this method of lighting appears to give complete satisfaction, and is very efficacious as regards illumination. Dust also quickly destroys the whiteness of the walls by settling on them. This can be obviated, at any rate to some extent, by brushing down at frequent intervals. The dazzling effect of the molten metal is of course unavoidable, and is more or less temporary. Glare from high intensity light sources has been noticed occasionally owing to their being placed too low.

Shadow is said to be specially undesirable, as tending to confuse the eye, and as reducing the illumination. In considering shadow, three points are of importance, namely, position, extent and depth. The position of a shadow is determined by the position of the responsible light source. The latter should of course be placed in the locality in which the shadow is undesirable. The extent of the shadow depends on the height of the light source; the greater the height the shorter the shadow. The depth depends on the presence or absence of neighboring light sources, or, in other words, on the evenness or unevenness of the illumination.

For this reason, for the lighting of a given area, it is preferable to have two sources of, say, 1,000 candle power each, rather than a single source of 2,000 candle power. It would appear that the most satisfactory method of lighting is by means of powerful units, fixed as high as possible above the floor, and spaced comparatively close together. Tables given in the report show that this method is adopted in most of the foundries classified as well lighted.

Results of Observations.

The results of observations show that a sharp distinction may be drawn between well and badly-lighted foundries. In some of the former, the very high minimum value of 1.5 foot-candles is attained and even exceeded, and the lighting may be considered good if the illumination does not fall below 0.5 foot-candle. In the badly-lighted foundries, in almost all instances, the system of lighting consists of ordinary flat-flame burners. In addition to their feeble intensity, these have other disadvantages. They are of necessity placed low down, and, in contrast with their dark surroundings, tend to dazzle the eye; they are also liable to flicker unpleasantly, and to cause confusing shadows, and are uneconomical from the point of view of gas consumption. Only one foundry lighted in this way could be described as even moderately well lighted; the others vary from poor to very bad.

The actual data indicate the extremely bad lighting that exists in some of these foundries, measurements as low as one-sixtieth of a foot-candle being recorded.

Some idea of this deficiency may be given when it is remembered that the minimum illumination in a poorly-lighted suburban street is about 1-100th of a foot-candle. It is probably impossible to secure really efficient lighting with the old-fashioned gas jets, and these should be replaced by some modern high-intensity system under expert advice, whereby not only would the illumination be greatly increased, but a large saving in the amount of gas consumed would follow. The investigation appears to show that the illumination received on a horizontal plane one foot above the floor level in:—

Well lighted iron foundries does not fall below 0.5 foot-candle.

Fairly lighted iron foundries does not fall below 0.3-0.4 foot candle.

Moderately lighted iron foundries does not fall below 0.2-0.3 foot candle.

Poorly lighted iron foundries does not fall below 0.1-0.2 foot-candle.

Badly lighted iron foundries is below 0.1 foot-candle.

It would seem, therefore, that the lighting cannot be deemed to be adequate unless the illumination received on a horizontal plane one foot above the floor level is not less than one-third of a foot-candle over any part in which work is being carried on or over which any person is liable to pass.

DOMINION STEEL DIRECTORS' TOUR.

MR. WILLIAM McMASTER, vice-president of the Dominion Iron & Steel Corporation, accompanied by W. G. Ross, George Caverhill, and Mark Workman, directors, returned on Aug. 28 from a trip of inspection of their properties in Cape Breton and Newfoundland. While visiting the properties they were accompanied by J. H. Plummer, president; D. McDougall, general manager of the Dominion Coal Co.; C. S. Martin, general superintendent of the Dominion Iron & Steel Co., and M. Scott, superintendent of the steel department. The itinerary included not only the inspection of the works at Sydney, but also the colleries in the Waterford district and the limestone quarries at Wabana, Newfoundland and Marble Mountain, C.B.

Two days were spent at Sydney on the inspection of the Steel Works, and the directors expressed themselves satisfied with the improved condition of the plant since their last visit. All construction work has been completed, and the following are some of the additions and extensions that have been made:

Recent Equipment Additions.

Two blast furnaces, making eight in all, are working satisfactorily.

A new 500-ton mixer has been installed, which takes care of all the steel made in the steel furnaces.

A rolling mill has been erected for the manufacture of round, square and flat bar steel, also a new wire mill, for making plain wire, galvanised wire and barbed wire, together with the new wire nail works, and a new cooperage. The wire rod mill was not working, there being no duty on wire rods; as a consequence the company is not able to secure the Canadian trade.

In the steel works and subsidiary plants there are about 3,500 employes.

The Coal Mines.

A day was taken in visiting the coal mines. At the present time there are seventeen collieries in Cape Breton, two of which have been recently opened. The site of the Victoria seam was visited. Men were working at the time, opening up the shaft. The mines are all operating to their capacity. The directors had not time to visit the two collieries at Springhill, which make nineteen in all. Including these two mines, it is hoped that the output of coal this year will come near to 5,000,000 tons. The mines as a whole employ 10,000 to 11,000 men.

Iron Ore Properties.

The iron ore property at Wabana was visited, and some of the directors who have not had the opportunity of seeing it before were gratified at the area and large deposits of ore, and also the amount of work, both open and submarine, that had been done. About 1,200 men are employed at these mines. Here the Nova Scotian officials courteously gave the party the opportunity of going down their shaft, some 8,000 feet in length.

The limestone quarries at Port au Port and Marble Mountain are turning out large quantities of limestone. The former, which is in Newfoundland, has only been opened within a year, but the product is of a most satisfactory character. The latter is on the Bras d'Or Lakes. These quarries, together with the Georges River quarries, employ some 800 men.

A Work of Vital Importance.

Mr. McMaster, in speaking of the plant of the corporation, expressed the opinion that, considering how these allied industries enter into the life of the Lower Provinces, and of the whole Dominion of Canada, how indispensable they are in the products they offer, how many are dependent upon their continuance for employment, and how necessary they have become in the growth and development of the country—the Government might well afford to give this business a degree of countenance which would be commensurate with the importance of the interests involved.

Newfoundland.

The conditions in Newfoundland Mr. McMaster found excellent, although the catch of fish, on which the people mainly depend, had not been so large as in former years. The price is high. The Reid Company are doing big things, with the energy and foresight which have marked all their undertakings from the moment the family became interested in Newfoundland. The company are, as is well known, interested in the railway development and water transportation feature, having a large fleet of good steamers doing a coastwise and United States business. They are also interested in the lumber and pulp industries, which they carry on with great vigour, giving employment to large numbers of people and, indeed, sustaining the largest interests, it might be said, in the old Crown Colony.

CANADA AND FOREIGN MARKETS.

"GET out into the market of the world," was the advice which Mr. R. S. Gourlay, president of the Canadian Manufacturers' Association, imparted to his fellow manufacturers at the Exhibition directors' luncheon the other day.

Mr. Gourlay said that manufacturing and agriculture went hand in hand, and that Canada had largely grown in those two directions to the development of national life. During the ten years ending in 1910, there had been tremendous growth in Canadian manufacturing industries. Establishments had increased by 31 per cent., capital by 179 per cent., salaries to officials by 85 per cent., wages to employees by 120 per cent., and products by 142 per cent.

"In every direction," said Mr. Gourlay, "the development of industrial life has been active, and in excess of any other period in the history of Canada.

Foreign Trade.

"Our increase in foreign trade, of 74 per cent., however, is relatively small, compared with the home trade. The time has come; yes, it is the obligation of every manufacturer to give some definite thought and attention and definite purpose to spending money to develop a foreign trade."

Ontario was face to face with the development of other Provinces along industrial lines. When the West learned Ontario's lesson, and went into mixed farming, industrial establishments would grow up to compete with those in this Province, and it would be well to prepare for that time by developing a foreign trade.

Will Wake Up.

"In a few years the West will wake up to the need of intensified farming, and the establishment of industries. That is why it would be a sane policy to reach out for the markets of the world," he said. "We have also to face the development of the Orient and to meet that we must know the markets of the world.

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H. V. TYRRELL - - - Business Manager

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Vol. X. SEPTEMBER 4, 1913 No. 10

PFINCIPAL CONTENTS.

FOUNDRY AND MACHINE EXHIBITION AT CHICAGO.

MOST gratifying prospects fall to be recorded for a great exhibition of foundry and general machinery equipment at Chicago, from October 10 to 17, in connection with the American Foundrymen's and Allied Association's Convention. Over 150 exhibitors have already been enrolled and practically every line of apparatus will be on show.

The Foundry & Machine Co. Executive are sparing no effort in the matter of publicity to secure the greatest attendance of buyers, superintendents, foremen and operators, yet gathered together at this annual function, and, as a consequence, mutually beneficial results are sure to be the ultimate reward. Some idea of the extent and diversity of the operating machinery equipment already booked for the big show, may be gathered from the fact that over 100 motors of varied horse power, and 4 air compressors of 1,600 cubic feet per minute total capacity, will be required.

In past years, Canadian Foundrymen have made little, if any attempt, to make their identity a feature, each travelling, more or less independently, and being generally unrecognizable, except, perhaps, for the fact that their name appeared in the official registration record. There is opportunity, we believe, for some combination on the part of the Canadian contingent. Travelling arrangements to and from the Convention and Exhibition City, whereby the bulk of the representatives would be together, and distinguishing badges which those who exhibit would not fail to take notice of, are two ideas that strike us as being worthy of putting into practical effect, and although the period for putting the suggestions into action is now somewhat limited, there is ample time yet to inaugurate a movement which will indicate in a more forceful way than hitherto, that Canadian foundrymen are progressive, and that, in the matter of foundry equipment, there is desire for the best and latest, and an ever widening scope for its instalation and operation.

THE CANADIAN NATIONAL EXHIBITION.

THE Canadian National Exhibition of the year 1913 is now in full swing, and, it goes without saying, that this latest product of "Queen City" genius loses nothing by comparison with its predecessors. The trend of our big show is unmistakably developing, however, into a species of circusdom, in spite of the agricultural and manufacturing features.

In the multitude of improvements and additions to the permanent equipment of the Exhibition, no evidence is apparent that the management have made endeavor to encourage and foster the pursuit and development of the craft of mechanical engineering in the variety of its many-sided aspects. The same old Machinery Hall is again packed with people and exhibits, for the most part so tightly, that it gives one the idea that a ship's stevedore had seen to the loading. The steps at the western entrance would almost make one feel that a somewhat studied indifference is manifested as to the propriety of a machinery building forming a part of the show at all. The management evidently do not realize that mechanical engineering in its myriad branches has done more for the uplift of the race generally, than any other art, craft, science or profession, and that the progress and development of this Dominion owes its present day high degree achievement and future outlook to the skill and capacity of engineers exemplified in their machine product.

Exhibitors in the Machinery Hall are full well aware that the conditions for display of their equipment are not such as to lend attractiveness to their exhibits, being rather the opposite in effect, and we are not a little surprised that the excellent material located for display should, as a consequence be so readily forthcoming. The advertisement due to apparatus being placed in the Canadian National Exhibition Machinery Hall, is and will be valueless as an auxiliary to a firm's own show room display until some definite steps are taken which will materialize into a Machinery Hall, at once an honor and credit to its title and purpose, and a recognition and tribute to what Canada and the civilized world owes to mechanical engineering industrial enterprise.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

	Mont'l.	Tor'to.
Grey Forge, Pittsburg.	.....	14 25
Lake Superior, charcoal, Chicago	.....	14 50
Middlesboro, No. 3....	20 00	21 50
Summerlee, No. 2	22 00	26 50
Carron, special	22 50	.....
Carron, soft	22 50	.....
Cleveland, No. 1......	19 25	22 00
Clarence, No. 3	20 00	21 00
Jarrow	.....	23 50
Glengarnock	.....	26 00
Michigan charcoal iron	27 00	.....
Ferro Nickel pig iron (Soo)	.....	25 00
Staveley, No. 1	20 00	22 50
" No. 3	20 00	22 00

BILLETS.

	Per Gross Ton.
Bessemer billets, Pittsburgh ...	$27 00
Open hearth billets, Pittsburgh.	27 00
Forging billets, Pittsburgh	34 00
Wire rods, Pittsburgh	28 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto..	2.10
Steel bars, f.o.b., Toronto........	2.15
Common bar iron, f.o.b., Montreal.	2.15
Steel bars, f.o.b., Montreal.......	2.25
Bessemer rails, heavy, at mill....	1.25
Steel bars, Pittsburgh, future	1.40
Tank plates, Pittsburgh, future...	1.45
Beams, Pittsburgh, future	1.45
Angles, Pittsburgh, future	1.45
Steel hoops, Pittsburgh	1.50

F.O.B., Toronto Warehouse.	Cents.
Steel bars	2.30
Small shapes	2.40

Warehouse, Freight and Duty to Pay.

	Cents.
Steel bars	1.85
Structural shapes	1.95
Plates	1.95

Freight, Pittsburgh to Toronto.

18 cents carload; 21 cents less carload.

BOILER PLATES.

	Mont'l.	Tor'to.
Plates, ¼ to ½ in., 100 lbs.	$2.35	$2.30
Heads, per 100 lbs.........	2.65	2.65
Tank plates, 3-16 in.......	2.60	2.55
Tubes, per 100 ft., 1 inch	9.50	8.50
" " 1¼ in.	9.50	8.50
" " 1½ "	9.50	9.00
" " 1¾ "	9.50	9.00
" " 2 "	8.75	8.75
" " 2½ "	11.15	11.50
" " 3 "	12.10	12.00
" " 3½ "	14.15	14.50
" " 4 "	18.00	18.00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Stove bolts	80 & 7½
Machine bolts, ⅜ and less	65 & 5
Machine bolts, 7-16.......	57½
Blank bolts	57½
Bolt ends	57½
Machine screws, iron, brass	35 p c.
Nuts, square, all sizes.....	4c per lb off
Nuts, Hexagon, all sizes..	4¼ per lb off
Fillister head	25 per cent.
Iron rivets	60, 10 p c off
Wood screws, flathead, bright	85, 10, 7½ p c off
Wood screws, flathead, brass	75, 10, 7½ p c off
Wood screws, flathead bronze	70, 10, 7½ p c off

National-Acme "Milled Products."

Sq. & Hex Head Cap Screws	65 & 10%
Sq. & Hex Head Cay Screws	65 & 10%
Rd. & Fil. Head Cap Screws	45-10-10%
Flat & But. Head Cap Screws	40-10-10%
Finished Nuts up to 1 in. ..	75%
Finished Nuts over 1 in. ..	72%
Semi-Fin. Nuts, up to 1 in...	75%
Semi-Fin. Nuts over 1 in.....	72%
Studs....	65%

Discounts f.o.b., Montreal.

WROUGHT IRON PIPE.

The following are Toronto jobbers' discounts on pipe in effect from April 21, 1913:

	Buttweld		Lapweld	
Standard	Black	Gal.	Black	Gal.
¼ ⅜ in.	62	47	....	....
½ in.	68	58	....	....
¾ to 1½	71½	61½	68½	58½
2 in.	71½	61½	68½	58½
2½ to 4 in. ..	71½	61½	70½	60½
4½ to 6 in. ..	....	....	71½	61½
7, 8, 10 in. ..	....	....	66	54

X Strong P. E.

¼, ⅜, ½in. ..	56½	46½	....	....
¾ to 1½ in. ..	67½	57½	....	....
2 to 3 in.	68½	58½	....	....
2½ to 4 in. ..	....	....	65	55
4½ to 6 in. ..	....	....	64	56
7 to 8 in.	....	....	55	45

XX Strong P. E.

½ to 2 in.	43	33	....	....
2½ to 4 in. ..	....	....	43	33

PRICES OF WROUGHT IRON PIPE.

Standard. Nom. Diam.	Price. per ft.	Extra Strong. Sizes Ins.	Price per ft.	D. Ex. Strong. Size Ins.	Price per ft.
⅛in	$ .05½	⅛in	$ .12	½	$ .32
¼in	.06	¼in	.07½	¾	.35
⅜in	.06	⅜in	.07½	1	.37
½in	.08½	½in	.11	1¼	.52½
¾in	.11½	¾in	.15	1½	.65
1 in	.17½	1 in	.22	2	.91
1¼in	.23½	1¼in	.30	2½	1.37
1½in	.27½	1½in	.36½	3	1.86
2 in	.37	2 in	.50½	3½	2.30
2½in	.58½	2½in	.77	4	2.76
3 in	.76½	3 in	1.03	4½	3.26
3½in	.92	3½in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4½in	1.27	4½in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.86	...	.....
7 in	2.38	7 in	3.81	...	.....
8 in	2.50	8 in	4.34	...	.....
8 in	2.88	9 in	4.90	...	.....
9 in	3.45	10 in	5.48	...	.....
10 in	3.20	....	....	...	.....
10 in	3.50	....	....	...	.....
10 in	4.12	....	....	...	.....

IRON PIPE FITTINGS.

Canadian malleable, 40 per cent.; cast iron, 65; standard bushings, 70; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 75; malleable, lipped unions, 65.

COKE AND COAL.

Solvay Foundry Coke	5.95
Connellsville Foundry Coke	5.45
Yough, Steam Lump Coal	3.93
Penn. Steam Lump Coal	3.63
Best Slack	2.95

All net ton f.o.b. Toronto.

OLD MATERIAL.

Dealers' Buying Prices.	Mont'l.	Tor'to.
Copper, light	$10 50	$11 50
Copper, crucible	12 50	14 50
Copper, uncr'bled, heavy	12 00	12 50
Copper wire, uncrc'bled	12 00	12 50
No. 1 machine compos'n	10 50	11 50
No. 1 comps'n turnings	9 50	9 50
No. 1 wrought iron	10 00	8 00
Heavy melting steel	8 00	10.00
No. 1 machinery cast iron	13 00	14 00
New brass clippings	8 50	9 00
No. 1 brass turnings	7 25	8 00
Heavy lead	3 50	4 00
Teal lead	2 75	3 00
Scrap zinc	3 00	3 50

METALS.

	Mont'l.	Tor'to.
Lake copper	$17.00	$16.25
Electrolytic copper	16.75	16.25
Spelter	5.75	5.75
Lead	5.60	5.00
Tin	45.00	42.00
Antimony	9.75	9.00
Aluminum	22.00	18.00

SMOOTH STEEL WIRE.

No. 6-9 gauge, $2.25 base; No. 10 gauge, 6c extra; No. 11 gauge, 12 extra; No. 12 gauge, 20c extra; No. 13 gauge, 30c extra; No. 14 gauge, 40c extra; No. 15 gauge, 55c extra; No. 16 gauge, 70c extra. Add 60c for coppering and $2 for tinning.

Extra net per 100 lb.—Spring wire; bright soft drawn, 15c; charcoal (extra quality), $1.25.

SHEETS.

	Mont'l.	Tor'to.
Sheets, black, No. 28	$2 75	$2 90
Canada plates, ordinary, 52 sheets	2 90	3 00
Canada plates, all bright	4 00	4 15
Apollo brand, 10¾ oz. (American)	4 30	4 20
Queen's Head, 28 B.W.G.	4 40	4 40
Fleur-de-Lis, 28 B.W.G.	4 20	4 25
Gorbal's Best Best, No. 28	4 40	4 40
Viking metal, No. 28	4 40	4 40

NAILS AND SPIKES.

Standard steel wire nails, base		$2 40
Cut nails	$2 60	2 65
Miscellaneous wire nails		75 per cent.
Pressed-spikes, ⅝ diam., 100 lbs.		2 85

FINE STEEL WIRE.

Discount 25 per cent. List of extras. In 100-lb. lots: No. 17, $5; No. 18, $5.50; No. 19, $6; No. 20, $6.65; No. 21, $7; No. 22, $7.30; No. 23, $7.65; No. 24, $8; No. 25, $9; No. 26, $9.50; No. 27, $10; No. 28, $11; No. 29, $12; No. 30, $13; No. 31, $14; No. 32, $15; No. 33, $16; No. 34, $17. Extras net. Tinned wire, Nos. 17-25, $2; Nos. 26-31, $4; Nos. 30-34, $6. Coppered, 75c; oiling, 10c.

MISCELLANEOUS.

	Cents
Putty, 100 lb drums	$2.70
Red dry lead, 5 cwt. casks, per cwt.	6.00
Glue, French medal, per lb	0.10
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.26
Benzine, per gal.	23½
Pure turpentine	0.60
Linseed oil, raw	0.60
Linseed oil, boiled	0.63
Plaster of Paris, per bbl.	2.10
Plumbers' Oakum, per 100 lbs.	3.25
Pure Manila rope	17

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents.

Montreal, August 30, 1913.—General business conditions have shown a slight improvement during the week, the prevailing optimism being reflected in the improved state of the building trade and the real estate business. Machinery brokers report business as still rather quiet, though one or two fair enquiries have been received. Eastern collections are fair, but from the West money still comes in slowly. A better tone is reported in finished lines of steel, consumers buying more heavily of miscellaneous products with the conviction that prices on the principal lines have about reached the lowest point. The pig iron market has been dull, with little movement. Prices remain unchanged.

The copper market is of considerable interest just now. Prices remain firm in view of the steady demand, and it is probable that before the end of the year there will be a marked advance in this metal.

Toronto, Ont., Sept. 2.—Business in machine tools was stimulated this week by the presence at the National Exhibition of several prominent manufacturers and agents with extensive exhibits. The Abitibi Pulp and Paper Co., Ltd., who have built an immense plant at Iroquois Falls, in Northern Ontario, are about to award the contract for their machine tool equipment, which will amount to about $15,000 worth.

Pipe Iron, Etc.

Nothing can be said regarding the pig iron market in Canada. Practically none is being manufactured, and quotations are not yet being made on English product. Business in warehouse steel plates, tubes, etc., is good, but practically no finished iron or steel is being imported. Manufacturers are not buying, and appear still to be waiting for prices to go down.

Metals.

The metal market was slightly firmer this morning, but not much business was being done. The copper market was slightly better. Tin was a little harder. Business in metals is quieter now than it has been since last October. It cannot be said that this is customary at this time of the year. It is merely the result of fluctuation in prices.

St. John, N.B., August 30, 1913.—One of the most prominent manufacturers in St. John, Major John James Gordon, died this week at his home in Coldbrook, following an illness of but a few weeks. He was about 60 years of age, and had been connected with many industries.

Charles Bradley, who conducted a boilermaking establishment in North St. John, died this week. He had been ill for some time.

There is a possibility that the town of Sackville, N.B., may take over the Sackville Electric light plant at a cost of $60,000. By securing the plant the town would be in a good position to offer industrial inducements in the way of special power rates, thus adding materially to the factories there.

There are now on their way to St. John, from Birmingham, Alta., eighteen cars of machinery, weighing approximately 792,000 pounds, made for the Atlantic Sugar Refineries, Ltd., by the Payne Joubert Machine and Foundry Co., which specialize in sugar machinery. C. Fricks, their representative, who is now in the city, will superintend the unloading.

Rhodes, Curry & Co., Ltd., of Amherst, N.S., have been awarded the contract for the new armory at Sussex, N.B., to be erected by the Militia Department. A call for tenders will be issued soon.

Operations commenced this week in the new plant of the Oil Motor and Manufacturing Co., Ltd., on Marsh Road, this city, in the machinery repair business, manufacture of elevators, etc., formerly conducted in Waterloo Street by Messrs. Myers.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Engineering

Hamilton, Ont.—The Dominion Steel Castings Co., are now occupying their recently completed office building, and the extensions to the plant are going forward rapidly.

Amherst, N.S.—The Board of Directors of the Nova Scotia Carriage & Motor Car Co., Ltd., have authorised the completion of the new plant, and the removal of all operations from Kentville to Amherst.

Guelph, Ont.—A new company known as the Guelph Brass Foundry Co. will take over the plant formerly occupied by the Dominion Axle Works Co. The company will manufacture all kinds of brass castings.

Exeter, Ont.—Reeve Heeman, Councillor Doyle and Mr. Geo. Connor went to Fredericton, Ohio, last week, to inspect a foundry. The company is willing to build a branch foundry in Exeter if suitable terms can be arranged.

Hamilton, Ont. — The factory, machinery and stock of the Hamilton Lock and Hardware Manufacturing Co., Ltd., will be sold here on Friday, September 9, by C. S. Scott, liquidator. The machinery is valued at $36,601.

London, Ont.—A fire on August 29th destroyed part of the Western Fair buildings, including machinery hall, transportation building, etc., the loss being $100,000. The G. T. R. car works across the street had a narrow escape.

Toronto, Ont.—Tate Electrics, Ltd., manufacturers of high-class electric automobiles, have leased the new building at number 165 Church Street for a term of years, and will take possession in a few days. The premises consist of modern showrooms and garage. The lease was negotiated by Messrs. R. B. Rice & Son.

Hamilton, Ont.—The Canada Steel Co., Ltd., whose rod mill and machine shop were burned this month, announce that contract has been let for the complete rebuilding of their plant, and for a reinforced concrete machine shop. Temporary work is being rushed ahead, and the plant should be running again by this week.

Toronto, Ont.—Plans submitted by the Canadian Rogers Co., Limited, for the construction of their new factory, have been approved by the city architect's department. The proposed building is to be erected at 570 West King Street, and is to be used for the manufacture of silverware. The structure will be of brick construction, three storeys and basement, and will cost $25,000.

Windsor, Ont.—The Burroughs Adding Machine Co., of Detroit, will establish a branch plant and sales office in Windsor. W. J. Healey, formerly of Toronto, has been appointed branch manager. All the Canadian business will be handled from Windsor, where an assembling plant will be established and eventually the machines for the Canadian trade will be manufactured here.

Orillia, Ont.—The rumoured reorganisation of the Tudhope Motor Co., Ltd., has resulted in the sale of the whole plant and machinery to the Fisher Motor Co., of Walkerville. The new concern takes possession at once, and will operate the factory here during the fall and winter, at least until the stock and material on hand are made up. The factory has been practically shut down for three months.

Sault Ste. Marie, Ont. — Damage amounting to several thousand dollars was done to the power plant of the Lake Superior Corporation on August 26th, when lightning struck the switchboard at the power plant. Fire broke out, and only by great effort was the steel plant saved from destruction. The water did considerable damage to electrical machinery, and about 1,500 men were thrown out temporarily.

Sydney, N.S.—It has been decided at once to reopen the old Scott pit of the Inter-Colonial Coal Company. A new surface plant will be immediately installed to operate this pit. It is estimated that at the outset the output will reach 1,000 tons a day. No. 4 pit is to be opened, developed and operated to its fullest capacity. New levels are to be driven in under the coal, and the output from this pit will be materially increased. This programme of the directorate of the Inter-Colonial Company will mean an increase in the number of labourers from 900 to 1,500, and a corresponding increase in the population of Westville.

Sydney, N.S.—The special agent of the British manufacturers has recommended the building of a steel ship plant and traction engine works at Sydney, Nova Scotia. The shipbuilding scheme involves an expenditure of about 1,000,000, and provides a plant capable of building steel ships of any size up to 7,000 tons for the freight and coasting service. The smaller craft will include tugs, tenders and other ships of such size and class. The products of the traction engine works will include all classes and types. In connection with the shipbuilding plant and the traction works it is pointed out that Sydney is exceptional in its advantages for this class of industry. Rail and water connection, steel producing mills, and the close proximity of coal make it a very desirable location for any iron or steel manufacturing concern.

Electrical

Estevan, Sask.—The council is considering extensive additions to the light and power plant.

Wadena, Sask.—The council will spend $16,000 for the erection and equipping of an electric light and power plant.

Wardner, B.C.—The electric power house of the Crows' Nest Pass Lumber Company at Wardner was recently destroyed by fire.

Souris, Man.—A by-law will be submitted on September 2nd authorizing the expenditure of $40,000 on an electric light and power plant.

Brantford, Ont.—The foundation for the new hydro-electric sub-station was started last Wednesday. The building is to be rushed to completion.

Swastika, Ont.—Work is proceeding in the new power plant and mill of the Huronia mines in Gauthier township. It should be finished inside of two months.

Wolseley, Sask.—A by-law was subed to the city of Windsor in the early spring if the present plans of the Hydro-Electric Power Commission materialize.

Wolseley, Sask.—A by-law was submitted on August 20 authorizing the town council to purchase the plant of the Central Light and Power Company, Wolseley, Sask.

Englehart, Ont.—The Power Company have purchased part of the Dowzer lot on Fourth Ave., and will erect a large structure of re-inforced concrete to be utilized as offices and store.

Observations on Bending and Welding Rolled Sections--II.

By Joseph Horner

The writer of this article, perhaps more than any others who have contributed to the editorial columns of the world's leading technical journals, is a recognized authority on workshop practice, whether the latter be the drafting room, pattern shop, foundry, machine shop or millwright section feature; and readers of "Canadian Machinery" engaged or interested in either of these branches of the mechanical engineering industry will find the regular occurrence and variety of subjects herein treated, helpful and instructive.

IN this article, we deal with the case of sections which are bent at acute angles, and which entail welding at each bending.

Taking first a plain rectangular frame, Figs. 11 and 12, such as form the distance-piece or diaphragms of box girders, these are made of a single length of iron or steel bent round and united by welding. It is obvious that there will be no special difficulty in bending the vertical corners—those corners (A) of the angle that stand at a right angle with the plane in which the bending takes place, but the corners (B) that lie in the plane of bending cannot be bent without causing them to crumple and pucker up. Thus, in Fig. 13, which represents above the length of straight bar, the portion (B) is metal which has to be got rid of before the angle can be bent round to 90 degs. It cannot be squeezed bodily into the metal on either side, it can only pucker up, and no amount of setting down with a flatter would make a decent job of it. This excess must, therefore, be cut right out as shown, before the iron can be bent. Only sufficient metal is left to form a scarf joint for welding, and a little excess for flatting over for the purpose of neat finish as shown in the lower part of Fig. 3. Fig. 14 shows how the same method is applied to the frame in Fig. 12.

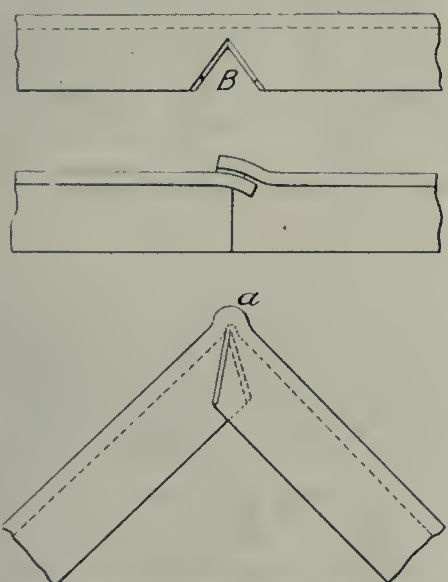
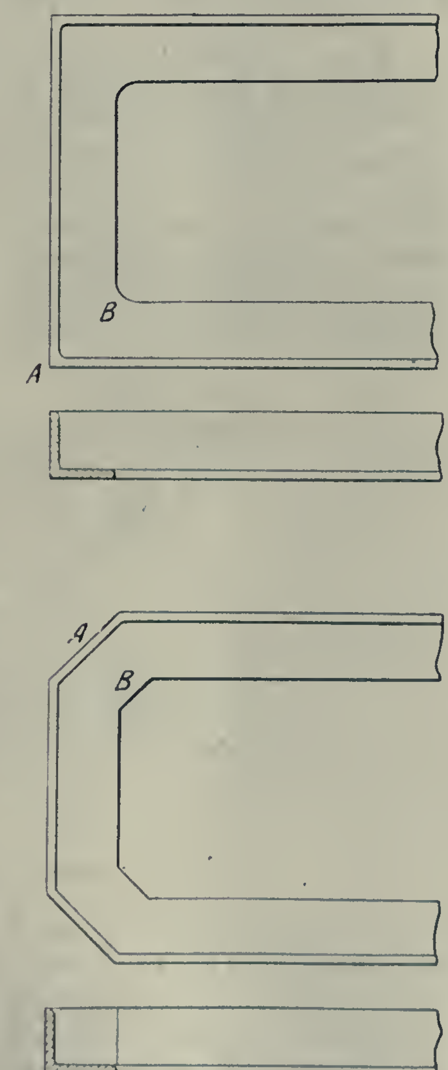


FIG. 13 CORNER AT RIGHT ANGLES.

There are, however, other ways in which the corners of these frames of angle section are treated. One is shown in Fig. 15. Here a smaller portion is cut out, leaving a lip (A) projecting to form a lap weld over (B), after the angle has been bent round. The open spaces left are filled up with burrs or punchings welded in Fig. 16. There, it is seen when the lip (A) is turned over and welded on (B), that although a small section might not be left destitute of metal, and the metal should come into actual contact, yet its section or thickness would not be equal in amount to the rest of the iron. In any case, therefore, one or two burrs or discs from the punching machine are welded in these corners, to bring up the metal to uniform thickness. After the welding is done, the surfaces are finished neatly by trimming off with the chisel and smoothing with the flatter.



FIGS. 11 AND 12. FRAMES TO BE MADE.

An external angle, Fig. 17, is treated like Fig. 13, but there can be no lap joint made in this case. One vee may be cut out, or two as shown, and the weld is made by a glut—a piece of plate (A). Just at this stage it is well to note sundry matters which are necessary to success.

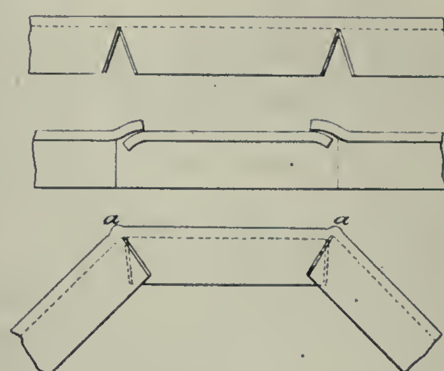


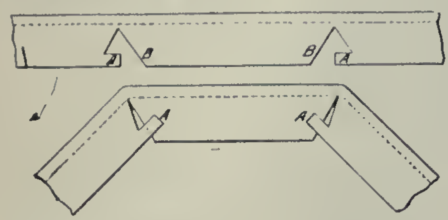
FIG. 14. CORNERS AT OBTUSE ANGLES.

Essentials to Success.

In the first place, the edges left by the vee cut out from the flat of the iron in Figs. 13 and 14 are cut with the chisel at an angle, so as to be well scarfed. This method is adopted when practicable in all welds, whether in common bars, in angles, or in plated work. It enables a better joint to be produced than could be made if the edges were left square. Another point is that the edges are not only scarfed, but are also very slightly fullered up or thickened. This leaves a trifle of metal to be smoothed down with the flatter after welding. Without this slight previous thickening with the fullering tool, the metal would leave the flatter rather thinner at the weld than elsewhere. This also is a practice adopted in making all welded joints.

We next observe that the iron is fullered at the part of the vertical web which has to be bent, and before the bending is done at (A) Figs. 13 and 14. If this precaution be not taken, the effect of bending is to form and leave a radius at the corner, instead of the keen angle required in Figs. 11 and 12. The edge is fullered, if done by hand, thus:

Two round bars are placed across the anvil, the iron, made red-hot is laid upon these, and the fuller is struck with a



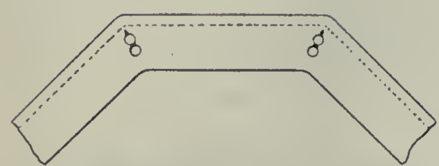


FIG. 15. (UPPER)—CORNERS AT OBTUSE ANGLES.
FIG. 16. BURRS WELDED IN CORNERS AT OBTUSE ANGLES.

sledge over the space supported between the bars. For each corner of the frame, excepting the last, the process is repeated and usually before any welding is done. The heating of the corner to be welded is done in the centre of a clear coke fire, or preferably in a hollow space enclosed and covered over with bricks in a fire, or in a small reverberatory furnace, depending on the practice of the

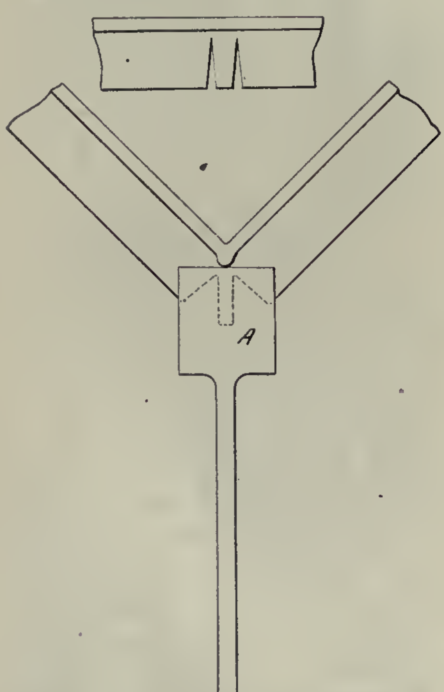


FIG. 17—GLUT WELDING EXTERIOR ANGLE.

shop. The method of welding is as follows:

Method of Welding.

A piece of plate, the glut (A) Fig. 17, sufficiently large to well cover and overlap the portion removed is cut off, and a porter, consisting of a bit of bar is welded to it. This piece of plate should be heated for welding in a fire separate from the angle. It is easier to get the heat of each right in this way, than if they are heated alongside of one another in the same forge; for it is not sufficient to merely place angle iron in the midst of a clear fire as a smith would a piece of common bar.

The coke used for fuel must not be allowed to come into contact with the face to be welded when it is at a welding heat. If it does, particles of it would sink into the iron or steel and produce holes. A hollow chamber, a kind of miniature reverberatory furnace, is therefore built around the angle-iron in a forge fire as follows: The fire is made up, and the blast put on until it becomes thoroughly hot. Then the angle iron is laid in it, and coke is piled round those parts that have not to be welded. Over the portion that has to be welded, a fire-brick is laid, supported clear of the face, and if necessary more than one

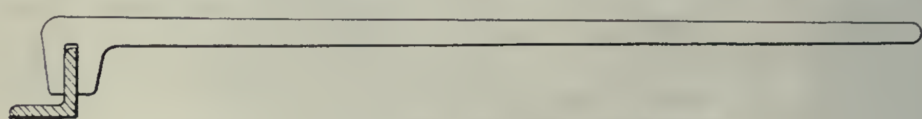


FIG. 19. APPLIANCE FOR GRIPPING ANGLE IRON.

brick is used. The brick is partially enclosed with coke, and the blast put on. The brick soon becomes white hot, and throws sufficient heat down upon the angle-iron to raise it to the welding heat.

From time to time the smith moves aside a portion of the surrounding coke and tries the surface to be welded with the point of the poker. When he judges by the sense of touch that the metal is

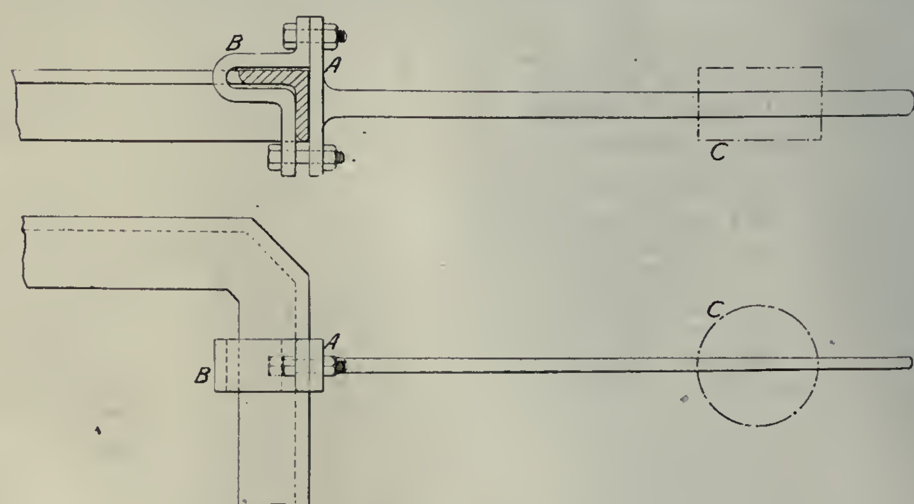


FIG. 20. METHOD OF HOLDING WORK.

soft enough for welding, he signals to his mate at the next fire, and if the glut is also ready, both are removed at the same instant, and brought to the anvil to be welded.

A very few blows suffice to make the actual weld, but two or three successive heats are required to finish off a corner completely. The surfaces of the weld have to be levelled with a flatter, and the outsides have to be gone over with

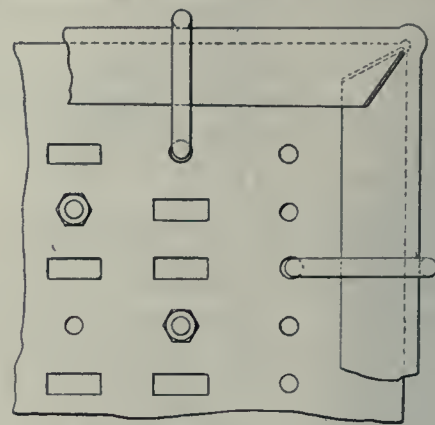


FIG. 18. WORK SECURED FOR WELDING.

a flatter on both inside and outside. Where the flat piece has been welded in, there is a projecting portion that has to be cut and trimmed off with a hot sett neatly. This work is a matter of detail which will occupy less or more time according to the skill or otherwise of the smith, but two or three heats will be a fair average.

It is tedious and troublesome work, for it must be remembered that strict accuracy is necessary, and the work while in progress is constantly being tested both upon the levelling block for the face, and with a square for the edges. A good deal of setting over with hammer and flatter is sometimes necessary, and this has to be repeated at every corner.

Holding and Handling

Provision has to be made for holding

and handling the angles. When in a pasty condition, coercion has to be exercised on the work to maintain its relations correctly while the welding is being done. The work may be picked up and handled with the tongs, but it must be laid on a block either during the closing of the weld or during the subsequent setting and correction. Let us take these in turn.

It is necessary to have a block of cast-iron for finishing angle frames upon. A block suitable is shown in Fig. 18. It is bolted down upon a common levelling-block so that it cannot be shifted while the work is being done with hammer and flatter upon the angle iron. If the block be made to the same size as the inside of the entire angle framing, so much the better, and this should be done when several frames of the same size have to be made, but for one or two rungs only, a block might be selected from stock smaller than the frame, or the ordinary levelling-block itself might be utilized.

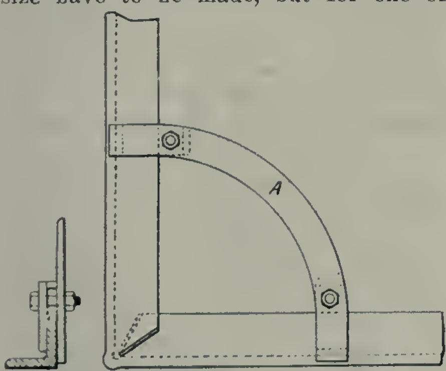


FIG. 21. SECURING ANGLE TO BE WELDED.

For handling and turning over angle-iron, various appliances are used. Thus, an angle is easily held by one end with a pair of specially-shaped tongs used for embracing the outside and the inside of the bar. For turning about at right angles to the length direction, a fork-like tool, Fig. 19 is also used, but when a large frame is partly made, neither of these appliances are suitable. It is too heavy to be handled by hand, its shape is also awkward, therefore, some appliance more or less like Fig. 20 is employed. This is slung by a chain which depends from the forge crane, and sustains the flat-ended bar (A). A clip (B) is bolted to the flat end of the bar, and between the two, the angle-iron frame is pinched. To counter-balance the weight of the frame, a movable weight—indicated at (C), may be pinched with a setscrew in any required position on the bar.

In frames of this kind, it is necessary to maintain the sides in their correct positions while welding and finishing the corners. A suitable method is that shown in Fig. 21. A piece of bar (A) is secured to the flat webs with strips, thickness pieces, and bolts. Such a general method is applicable to any shape, of which Fig. 22 is one example and is self-explanatory.

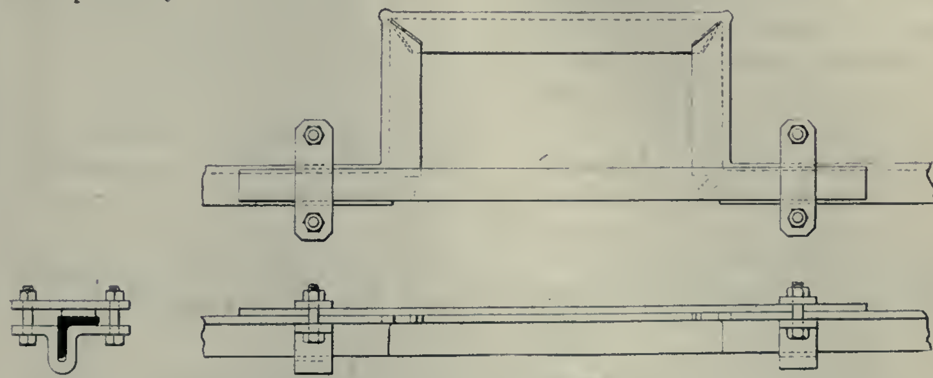


FIG. 22. SECURING ANGLE TO BE WELDED.

When owing to the size of the work or the few pieces required, the cost of setting blocks is not incurred, a good deal can be done on the regular levelling blocks. Fig. 23 is one example of this kind. One block (A) takes charge of an angular interior portion, and a screw block (B) set with a tang in one of the holes of the block is used to impart pressure to the portion to be set.

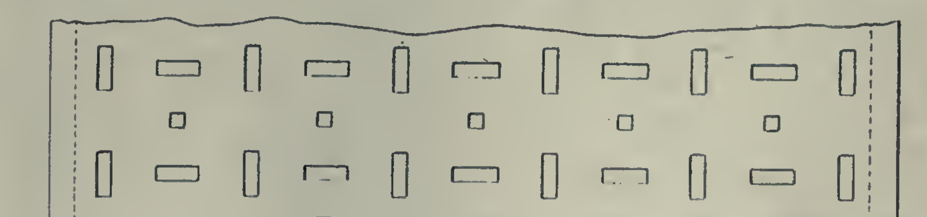


FIG. 23. SETTING ANGLE ON LEVELLING BLOCK.

CANADIAN IRON AND STEEL WORKS.

THE Bureau of Statistics of the American Iron and Steel Institute reports that in 1912 there were in Canada 21 rolling mills and 10 plants which made steel ingots or castings, but not finished forms of rolled iron or steel. Four rolling mills and steel works were idle, one in Quebec and three in Ontario. Six of the rolling mills and steel works active in 1912 are located in Nova Scotia, eight in Quebec, 13 in Ontario, and one each in Alberta, Manitoba, New Brunswick, and British Columbia.

In 1912 four new steel casting plants were built—two in Ontario and two in Quebec. None of these plants is equipped with hot trains or rolls. On December 31, 1912, a plant was being built at Redcliff, in the province of Alberta, for the manufacture of merchant bars.

Blast Furnaces.

Canada had 20 completed blast furnaces on June 30, 1913, of which 13 were in blast and seven were idle. Of the total, 16 furnaces used coke for fuel, and four used charcoal. Two furnaces, one charcoal and one coke, were being built on June 30. In the first half of this year, two plants made ferrosilicon and ferrophosphorus in electric furnaces.

The Dominion Iron & Steel Co., Sydney, N.S., completed a new furnace this year, which was blown in on May 22. It has an annual capacity of 91,250 tons of basic pig iron. Of two blast furnaces being built on June 30, one will be operated by the Canadian Furnace Co., at Port Colborne, Ont. It will have an annual capacity of about 125,000 gross tons. Lake Superior ore and Connellsville coke will be used. It is almost ready to blow in. The Standard Iron Co., Montreal, is building a charcoal furnace at Parry Sound, Ont., its annual capacity being about 36,000 gross tons. It is practically complete. Hematite and magnetite ore from Michigan and Ontario will be used.

The annual capacity of the 20 completed Canadian blast furnaces on June 30, 1913, was 1,391,550 gross tons, and of the two furnaces building was 161,000 tons, a total of 1,552,550 tons. The capacity of the completed coke furnaces was 1,354,750 tons, and the capacity of the completed charcoal furnaces 36,800 tons. The capacity of the coke furnace in process of building was 125,000 tons, and of the uncompleted charcoal furnace 36,000 tons.

Some Lighting Economies in Engineering Works

By Henry S. Whiteley

In many works it is possible to reduce the consumption of electricity for lighting purposes without sacrificing efficiency. The writer here relates a few examples which have come under his notice and may prove of interest to many readers.

IN a modern engineer's erecting shop, having a large bay surrounded by a gallery and served with a travelling crane—the bay, 100 ft. long by 30 ft. wide, was lighted by four 15-amp. open type arc lamps arranged in two groups, two in series per group on 110-volt circuit; the lamps being suspended at a height of 40 ft. so as to clear the crane. The four lamps took 3,300 watts and gave an approximate mean hemispherical candle-power of 5,090, but owing to uneven distribution, they lighted the gallery and crane girders more than the shop floor where it was most needed.

It was decided, therefore, to improve the lighting—and also, what was equally important, to reduce the load on generators, by substituting four of the latest pattern flame arc lamps of the Bremner type, having inclined carbon feed, and using chemical carbons giving a deep yellow light. The new lamps, arranged as before, took 10 amps., or a total of 2,200 watts with an approximate mean hemispherical candle-power of 12,760, and gave an evenly diffused light over the shop floor, besides giving an imaginary sense of warmth due to the color. The saving in watts due to the change was 33½ per cent., or an equivalent of 1.47 h.p., coupled with a gain in candle-power of 250 per cent.

Foundry Example.

In a foundry 60 ft. long by 40 ft. wide, served with a travelling crane, the floor was lighted by means of four open type arc lamps swung on long swivelling arms attached to the rail girders of the crane, so that the latter could pass over, these lamps being also arranged in two groups, one of wihch took 10 amps. at 110 volts., and the other 6 amps., or a total wattage of 1,760, with a mean hemispherical candle-power of 2,710.

The four lamps were replaced by two flame arcs of the type aforenamed, suspended centrally in the bay, but this time placed at a height just sufficient to clear the top of the crane. The total wattage taken was 1,100, with a mean hemispherical candle-power of 6,380, the alteration thus giving a saving of 37½ per cent. in watts or an equivalent of .88 h.p. Also, there was half the time saved in carboning, besides the use of moulders' hands torch lamps were no longer required when finishing off a mould.

Metal Filament Lamps.

The advent of the metal filament lamp with its 1.0 to 1.5 watts per candle-power compared with the carbon filament lamp taking 3 to 4 watts per candle-power, has proved a boon to householders and shopkeepers in the reduction of their electricity accounts, but for industrial works, particularly where vibration and the use of counterweight fittings are general, the use of the metal filament lamp has usually proved costly, owing to the heavy renewal bill; but, by careful discrimination, it is quite possible to successfully use these lamps and obtain a long life.

To such an end, it is advisable that where there is the least suspicion of vibration, either constant or intermittent, such as that due to the handling of heavy goods on upper floors, they should be spring suspended, and it is a good policy never to use metal filament lamps on counterweight fittings, or where they are liable to receive rough usage; 90 per cent. of failures of these lamps are due to mechanical troubles only.

Individual Lights.

In dealing with the individual lights necessarily required by the operators of various classes of machinery usually 8 or 16 C.P. lamps of the carbon type are used, according to the class of machine. Here, for prementioned reasons, the metal filament lamp is out of the question; but, in a certain case where an economy was desired, the writer obtained very satisfactory results by the adoption of a lamp which possesses the mechanical strength of the carbon lamp, but taking less watts per candle-power—a lamp having a metallic coated filament whose consumption in a 10 C.P. size = 32 watts, and in a 16 C.P. size = 45 watts.

By the use of the 10 C.P. size in 100 lights for machine operators, where formerly seventy-five 16 C.P. and twenty-five 8 C.P. carbon lamps were in use, a saving of 2,050 watts=2.74 h.p. was obtained; but though the total candle-power was considerably less, the intrinsic brightness of the filament was so much higher compared with the old lamps as to make the machinery appear better lighted.

The use of metal filament lamps in groups of three or four placed at an angle is not advised—again owing to breakage of filament. It will be found that one high candle-power lamp is much more satisfactory than four of low candle-power. These high candle-power lamps, as now made from 100 C.P. upwards, lend themselves very well for lighting small areas. A smith's shop with eight hearths was lighted with twelve 16 C.P. carbon lamps, taking a total of 700 watts. At suitable points three 100 C.P. metal filament lamps were placed, and the twelve 16 C.P. lamps removed. The new wattage was 360, or a saving of nearly 50 per cent. = .45 h.p., with a gain of over one-third in candle-power. Also, there was less attention to fittings, and saving of lamp renewals.

A careful consideration of works lighting may often show places where an improvement can be obtained, and particularly do these remarks apply to some of the older installations.—"The Power User."

NOTES ON THE ART OF MANAGEMENT.

IN a recent issue of the "Machine Tool Engineer," the following observations on the above subject appear as a contribution from the pen of an engineer with experience both as a foreman and manager:—

"When articles are made under day-work conditions the rise of cost is not always because the foreman has failed in his duty and become slack in his organization and control. Waster castings or forgings are, in most instances, not found out to be wasters until a certain amount of labor has been expended upon them, especially in castings where blow-holes come to light only after the outer skin has been broken. Then, there are wasters due to the workman's neglect or to some accident to his machine. The best of men are neglectful at times, and in day-work the cost comes upon the firm. In piecework it is the general rule for the workman to replace his labor free. If the waster is due to accident it is only fair that the firm should stand the loss."

Overtime and Piecework.

"Then, there are the overtime extra changes. These in common fairness to the foreman should not be considered when comparing the cost of the same articles manufactured at different times, as this is a thing out of his control altogether, the fact of orders coming in faster than they can be completed being mostly the cause of overtime having to be worked. The primary idea was to get a more even cost and enable a correct estimate to be given before the work was put in hand, but even in shops where piecework is the prevailing system, the costs fluctuate nearly as much as they do in a shop where day-work is the rule.

The causes enumerated above are sometimes responsible for this, but there are others which creep in under the piecework system. In many cases when it is decided to institute piecework in a firm which has worked day-work, the previous costs are taken as a basis and prices fixed on those. This is invariably done by one of the cost-office staff, who, above everything else, is a clerk and not a practical engineer, whatever his position in the cost office may be, and nobody can expect him to be able to form an opinion in regard to the cost of an article—still less to fix a fair cost — therefore, he can only strike an average if the article has been manufactured at various times, or accept the cost as shown in the books, if it has only been made once before. These costs are invariably wrong as regards actual labor costs, as they may be and are in many cases inflated by the causes mentioned before—wasters, overtime, etc. — which are not usually shown in detail, especially in the older forms of cost keeping."

The Rate Fixer.

"When a firm adopt this way of instituting piece-work, the prices are usually fixed by a rate fixer in the cost office, who, as I said before, is in most cases not a practical man, and sent down to the various departments, the foremen, on whom, by the way, rests all the responsibility of the costs in their departments, having nothing whatever to do with the prices given, whether they are high, fair, or low. Now, in my opinion - and I speak from experience both as a foreman and manager—it is far better if it is decided to have the prices fixed in this way, to have a rate fixer for each department, who, above everything else, must be an authority on the manufacture in the department in which he is placed, as no one man can be an authority on every department. Another, and by far a better way is for the foreman to fix the prices for his own department, as, of course, he is responsible for the cost as well as for the general organization of the shop, and there will be a better feeling in the shop, as the men will know that the foreman is prepared to uphold his price by demonstrating or explaining how the article can be made for the price."

Night Shifts and Changes.

"When the work is too great to be dealt with in the ordinary day hours, with perhaps two or three hours overtime, a night shift is started. If a day-work shop, the actual labor cost per article rises. No matter how good the extra workmen may be, strangers can never complete as much work in equal hours as the men who are used to the shop conditions, and this holds good for some time. If the shop is worked on a piecework system there is less chance of the actual cost rising, as both the day and night man enter their time in the same piece book, the balance made being shared according to the hours each works on the job.

Again, a man may be leaving who has, by working a certain machine a number of years, got the full output from it. The man who replaces him, though a good man, may run a few jobs into debt, thereby raising the cost. This can be provided for to a certain extent by the foreman having another man in the shop, who is perhaps working a similar machine but smaller, ready to replace such by putting him on the larger machine when the man is breaking time."

Allowance for Variable Elements.

"If the cost office would institute a system, by having a few more columns in their books, whereby they could see at a glance actual time taken, extra time for overtime, time replacing waster, cause of waster, piece price, balance, if any, it would facilitate estimating considerably, give the reason for the extra cost, if any, and incidentally save many an argument between the manager and foreman. The only time when the foreman ought to be asked to explain the extra cost would be when all the columns were empty excepting the piece price and time taken, the time taken showing a larger cost than the price given, as that would show the price was too low, or, providing a balance had been made on the same job before, the workman was not competent.

Providing this system was worked up to and records were sent out to the foremen directly, a cost was found to be going up, it would help them considerably, they would be able to give a more satisfactory reason on account of the job being fresh in their mind, and be helped to keep a better supervision of their costs."

AMERICAN PATENT SYSTEM.

THE relation of letters patent to modern industrial conditions formed the subject of an address by Mr. F. P. Fish, of Massachusetts, at the meeting of the section of patent trade mark and copyright law of the recent American Bar Convention at Montreal. The speaker described the patent system in America as the best in the world and absolutely necessary for the industrial prosperity and growth of the country. Today, he affirmed, patent systems are of more value than ever. No other form of reward was offered, and this has been decided practically unanimously to be the most fitting.

Under the American system, the men who produce inventions receive their reward only when they have invented something that the public wants, but through the history of invention the failures have stood out very conspicuously. It is not even every good idea that pays. Sometimes it may be too soon. The act of invention is only a step towards bringing profit to the inventor, and very few inventors have the ability to put their ideas in a commercial form. Our patent system, the best in the world, is absolutely necessary for the development and growth of our country, and that growth does not come without stimulus. The patent system provides that stimulus.

PATENT REPORT.

THE following patents were recently secured through the agency of Marion & Marion, Patent Attorneys, Montreal, Canada, and Washington, D.C.:—

Nos.

149,777—Harry K. Pell, Nordin, N.B. Wagon gear.

149,829—Julius Dorneth, Berlin, Germany. Typeline casting machine.

150,101—Joseph Carreau, Montreal, Que. Skin and hair tonic.

150,116—Charles C. Freeman, Day Dawn, W. Australia. Grinding pan discharge and classifier.

150,141—Arsene Riopel, St. Elie de Caxton, Que. Rowlock.

Drill Jig and Fixture Design and Construction

By H. R.

The sketches and data will, the writer hopes, appeal to machine shop superintendents, designers, toolmakers, and novices, as indicating the large place jigs of every kind and for every service occupy to-day in machine shop practice. The present article is the fourth of a series.

THIS article, and the next few, will deal fully with all kinds of clamping methods and devices, and perhaps it would be as well to remind the reader of the importance of suitably clamping the work, so as not to distort either the component or the jig. On the other hand, the work will have to be extremely rigid. This will be better explained by the following table, which shows the great amount of pressure required for drilling cast iron:—

Drill Diam.	Max. pressure on drill while drilling.	Max. pressure on drill while drilling with full diam. of drill.
1/4 in..	300-350 lbs.	400-500 lbs.
1/2 „ ..	700-800 „	900-1,000 „
3/4 „ ..	800-900 „	1,000-1,200 „
1 „ ..	900-1,000 „	1,200-1,500 „
1 1/4 „ ..	1,000-1,100 „	1,400-1,800 „

Reference to Illustrations.

Fig 69 is the commonest of all clamps, being used in every kind of jig and fixture work. They are also used extensively for clamping down work on milling machines and planers, etc. For drill jig work, it is well that the designer, if possible, saves the operator the trouble of unscrewing the nut right off to get the work out of the jig. This becomes necessary in order that the clamp may be swung out of the way of the work.

In fig. 70, this is not necessary, because the slot enables the strap to be pulled clear of the work, and it will be readily noticed that the turned down portion is made to suit the height of the work to be held. This saves the necessity of having packing pieces.

Fig. 71 is made so as to be adjustable. This is accomplished by the set screw, and the hole can be elongated if found necessary.

Fig. 72 is of the same design as Fig. 70, but has a finger-formed end for getting into close places. It is termed a finger clamp. When the clamping of the work is set up high, Fig. 73 shows a method of holding the clamp always up to the required height. This is done by placing a spring under the clamp, and if clamps of this description do not have a spring under them, they become an encumbrance.

Fig. 74 is a divided clamp used on work with ribs.

Fig. 75 is much used on milling work, but is sometimes equally adapted for the drill jig. The clamp being cranked enables the top of the screwing-down nut to come flush with its top, and not stand above the top of the work.

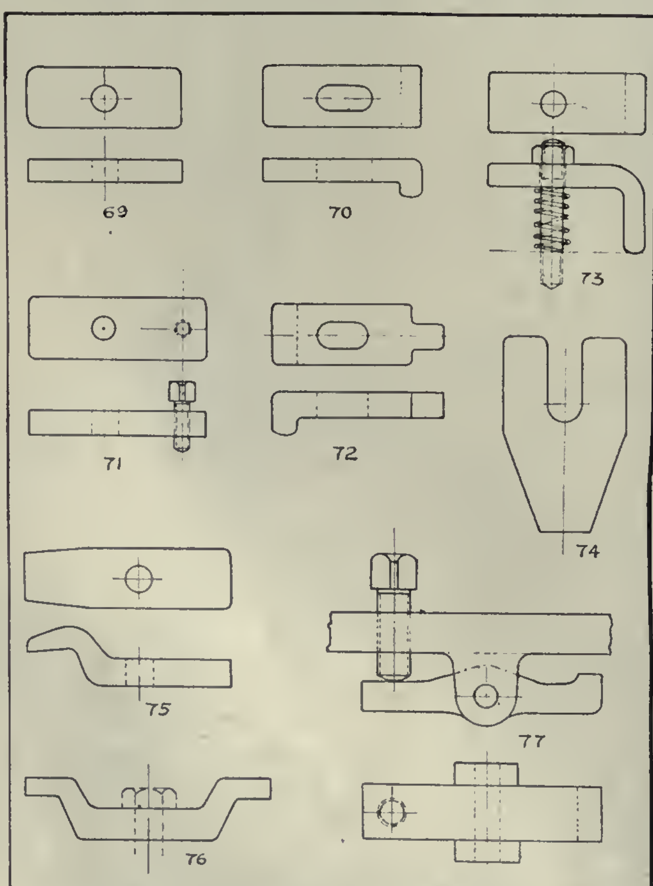
Fig. 76 is a double-ended clamp of the same type as Fig 75.

Fig 77 shows a very suitable and effective way of holding flat plates, although it may be equally as well applied to other purposes. The clamping lever is pivoted, and pressure is applied through a set screw from the top of the jig. This can be also reversed if required by screwing the set screw into the clamp, and pressing on to the casting.

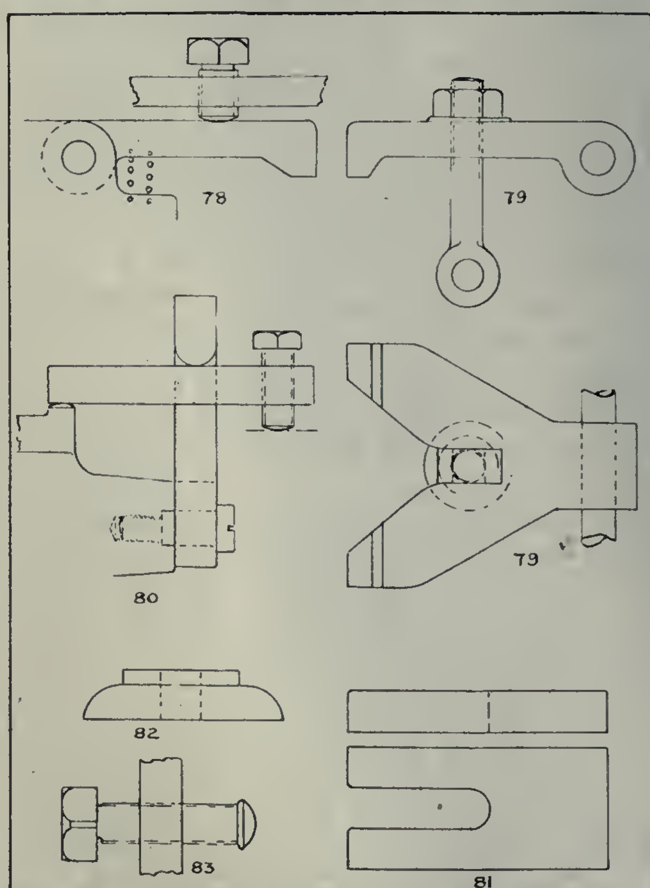
Fig. 78 is a clamping device that may be utilised in close places. The clamp is pivoted, and the pressure is applied through the set screw, and, for convenience, the coiled spring is always holding the clamp up to the set screw, or in other words, prevents the clamp from falling.

Fig 79 is a very useful device. It comprises a swing forked strap, and, as will be readily seen, the screwing-down bolt is also pivoted, enabling the swing strap to be freely swung away without adjusting the nut to any extent.

In Fig. 80, the strap is of the same design as Fig. 71, but is used with a vertical swinging piece. This has a fulcrum which screws into the jig.



CLAMPING METHODS AND DEVICES.

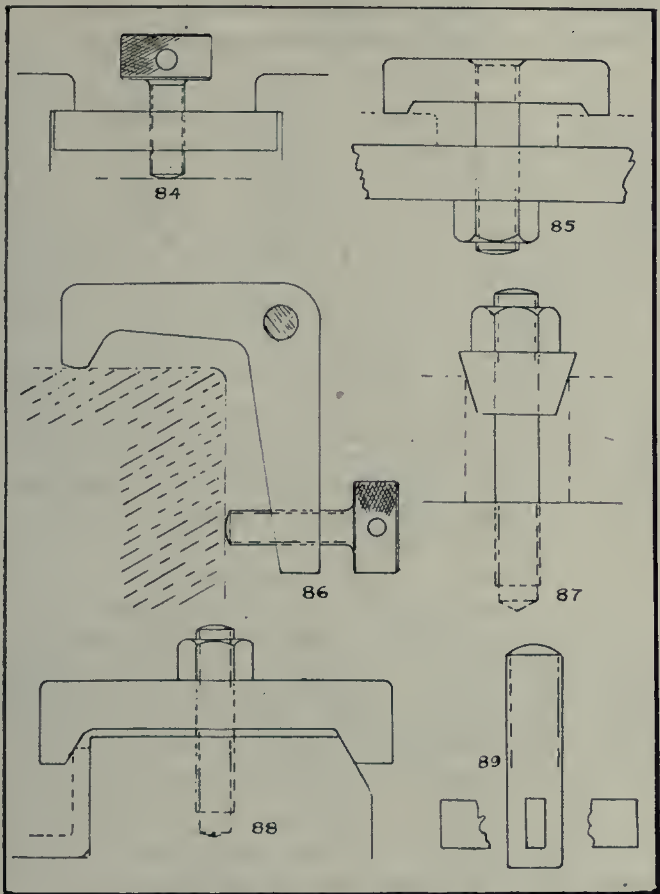


CLAMPING METHODS AND DEVICES.

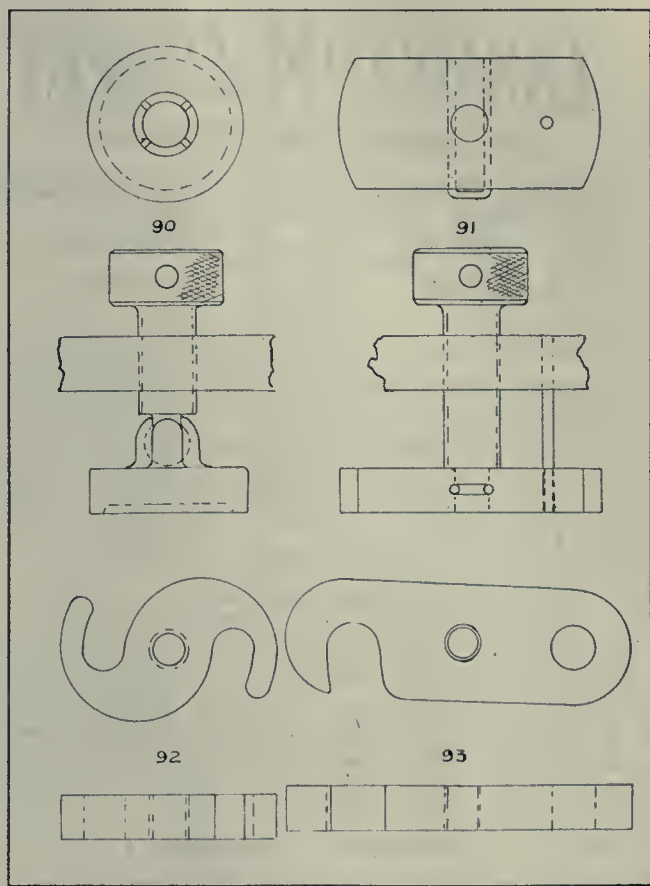
Fig. 81 is a finger clamp, but with the end not reduced, as in Fig 74.

Fig. 82 shows a washer made of cast iron, of which many are used in some shops.

readily seen that this arrangement not only locates the work for squareness, but pulls down on to the work in addition. It is very useful for adoption with a revolvable where the work can be strap in which the screw has to work. A (U) piece is then knocked into these holes which conform with the recess or groove in the screw. The strap is held from turning with the screw by the pin



CLAMPING METHODS AND DEVICES.



CLAMPING METHODS AND DEVICES.

In Fig. 83 is shown a clamping set screw. It will be clearly seen that the end is burred over, being a wise provision to prevent the loss of set screws, etc. If this be not done, very often a man wastes a lot of time looking for a set screw that is short from the jig he is about to operate with. By burring over, the screws cannot be lost or taken away for other purposes.

Fig. 84 is a good way of clamping, for by simply loosing the screw from the work the clamp can be drawn away from the jig, and the work easily released from the jig.

Fig. 85 shows a clamp for pulling down on to the work. The nut being at the bottom there are no projections above the work. This is especially adapted for milling machine operations.

Fig. 86 is a good way of holding a component, holding the work from two sides. The lever is pivoted, and by screwing the screw inwards it applies the pressure on to the casting or work in two places. It is also well adapted for work in close places.

Fig. 87 is a taper clamping attachment. This, of course, can be made any size, and acts equally well. It can be loaded at one end while the milling cutters are at work on the other side.

Fig. 88 is a useful clamping device, and from the illustration it will be seen that by screwing down the nut on to the clamp the latter presses down the work as well as pulling it back to a face. This is adaptable for milling jig work as well as for drilling.

Fig. 89 is a slotted stud, useful in many ways for clamping work, etc.

Fig. 90 is what is termed a floating clamp for irregular faces. The screw has turned on the end a ball which fits into a cage on the strap. This strap is turned into a disc, with a boss projection formed and drilled to suit the diameter of the ball, being afterwards sawn in four places as shown. The screw, after being fitted into its screwing strap, is put into the formed projection, and the lips are afterwards peened over. It makes a very good and simple ball joint which will line up to any irregular casting.

Fig. 91 is another good clamp. This is pressed down by the screw working in a portion of the jig. The end of this screw is turned with a groove around same. Two holes are drilled into the set in the strap, which slides up and down in the part of the jig, as the screw is worked.

Fig. 92 is a strap working in conjunction with two pins which have heads turned on them. By this method the strap can be swung about its centre.

Fig. 93 is a swing strap, which is swung in position on a fulcrum after the operating screw has been released, and affords the saving of considerable time.

TREATING FOUNDRY SAND.

FOUNDRYMEN will be interested in the experiments that have recently been conducted at Detroit. A complete plant for treating foundry sand either by dry or wet process, for rebonding old sand for use as moulding sand, and for the treatment of new sand to increase its value, is to be erected in the laboratory of the H. M. Lane Co., Detroit. It will have a capacity of about 15 tons of sand per day. It is stated that preliminary tests seem to indicate that 70 per cent. of the old sand now being carried to the dump can be recovered and re-used.

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Vol. X. SEPTEMBER 11, 1913 No. 11

PRINCIPAL CONTENTS.

CANADIAN NATIONAL EXHIBITION MACHINERY HALL.

TORONTO Exhibition has appropriated the word "National," and to all and sundry this conglomeracity in the whole Dominion that is able to assume and Canadian National Exhibition. Moreover, there is no show in the whole Dominion that is able to assume and carry this title with such dignity as Toronto. The show is now witnessed by over a million people annually from every corner of Canada and the United States. It is patronised by Royalty and the aristocracy, and the greatest men in the Empire consider it an honour to be invited to its yearly inauguration.

By attaching the word "National" to the title, the exhibits themselves assume a National character, and in every building but one, they do so grandly. It is, perhaps, the most important of them all, the basis of all the others, that is housed in an inadequate, dirty, dangerous, disreputable building. Reference is made to the Machinery Hall, of which the directors have become ashamed. There is a well-grounded rumor afloat that before the next C. N. Exhibition opens its gates, another Machinery Hall will have taken the place of the present frame building, and it is unnecessary to say that the quality of the machinery exhibits will have improved commensurately.

It is not intended here to say anything disparaging about the firms who have valiantly done the best they could this year, and other years, under the circumstances. Some declare that never before has there been such a varied and excellent show of machinery as was packed into the Machinery Hall this year. On the other hand, Mr. Booth, Chairman of the Executive, who is also treasurer of the Canadian Manufacturers' Association, recalled to the writer the days when the largest manufacturers of machine tools in Canada vied with each other in their efforts to put up the best show of tools. They are gone, tired of the endeavour to show modern tools to advantage in such a building, with such appliances.

Mr. William Inglis, managing director of the John Inglis Co., Toronto, who is chairman of the Machinery Hall section, and has charge of the placing of exhibits in that building, has been requested to prepare drawings for a suggested new Machinery Hall, which will be considered by the Executive at their next meeting, and their recommendations will be passed on to the directors. This does not mean that it has been definitely decided to construct a new hall, but it is a step in that direction. The Executive are divided whether to build an Art Building or a Machinery Hall first. The director of the former insists that the space at his disposal is not adequate enough to enable him to display his pictures effectively, and that it will be impossible to exhibit another year in the present building. It is a fact, however, that although technically the directors are required to obtain the permission of the Toronto ratepayers before constructing new buildings, yet they have enough money and the power to go ahead with the construction of both a new Art Building and a new Machinery Hall.

Mr. Percy Rogers, chief clerk of the Exhibition, speaking to a representative of "Canadian Machinery," in the absence of Dr. Orr, the secretary, said that of all the exhibits he thought machinery took first place in importance. They quite realised the inadequacy of the present Machinery Hall. A new building should be erected at the earliest possible moment, as the exhibits in other buildings were expanding so rapidly they could not longer harbor machinery which should be in the Machinery Hall.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

A SHAPER PROBLEM.

By J. H. R.

THE accompanying sketch shows a simple, but somewhat interesting, shaper job. Fig. 1 represents the feed shaft of a certain machine, upon which a head travels lengthwise, being advanced at each revolution of the shaft (A), a distance of one-half inch, by the action of the rack (B). It is desired to find the angle of the groove in the rack, and the lateral feed of the shaper table.

While the average mechanic would, no doubt, insert the blank strip, and lay off the desired position of the grooves, a mathematical solution of the question may be of interest to some of the readers, as several of the men in the shop could not see why the grooves in the rack would be spaced different than those in the shaft.

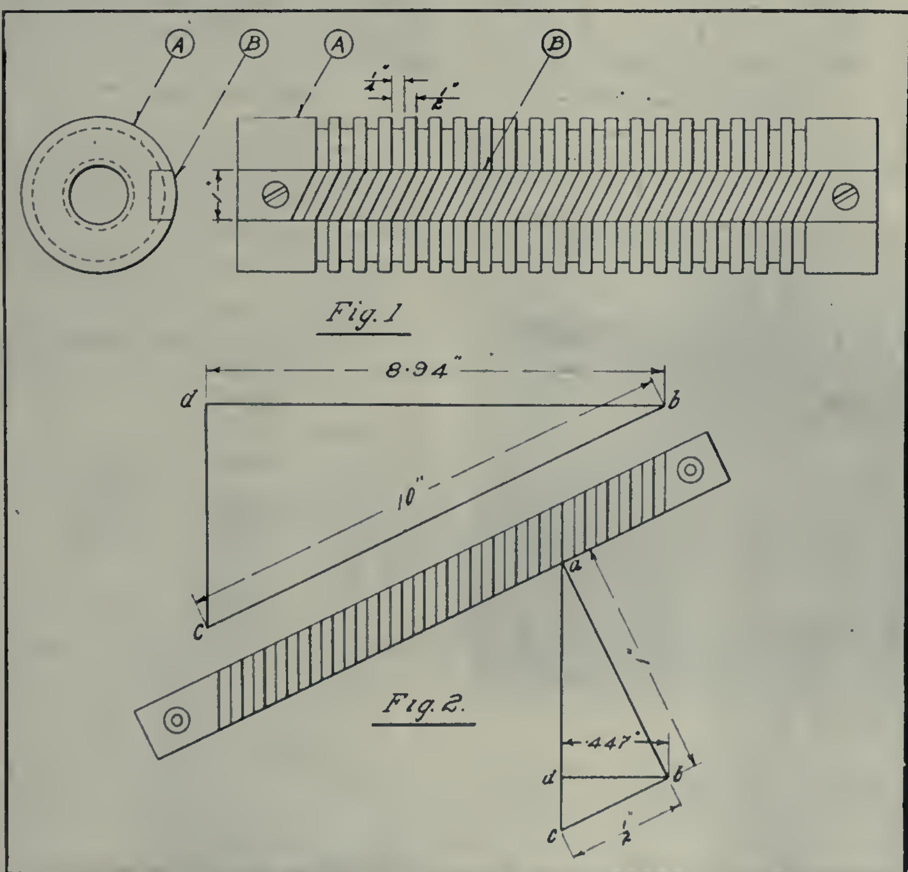
First, to find the angle at which to set the shaper vise. In Fig. 2, the right triangle (abc) is enlarged for clearer demonstration. The length (a-b) represents the width of the rack, and (b-c) the pitch; then by the trigonometric functions we have:—

$$\text{Tangent of angle (a) equals } \frac{\text{side opposite}}{\text{side adjacent}} \text{ equals } \frac{.5}{1} \text{ equals } .50000$$

Angle corresponding equals 26 degs.—34 ft. nearly.

To find the lateral feed of the shaper table, or the distance (b-d), we have:—

Side opposite equals hypotenuse $\times$ sine equals $1 \times .44724$ equals .447 inches nearly.



SKETCH RELATING TO A SHAPER PROBLEM.

Total feed for the 20 grooves equals $.447 \times 20$ equal 8.940 inches nearly.

The groove being ¼ in. wide, the rib of the rack (B) is somewhat narrower than the rib in the shaft (A).

WANTED A REASON WHY?

By D. A. Hampson.

IN 1909, the Middlesex Tool Works purchased a sensitive drill press from the Smith Machine Tool Co., for \$80. The machine was of the friction drive type, equipped with ball thrust bearings on the spindle, and on the friction driven shaft. It was put to work drilling ⅜ inch holes in machine steel bars, and, as the months rolled by, it continued to do its work quickly and well, its upkeep being nothing more than the time required to occasionally tighten the frictions.

The business increased, and, in 1912, the Middlesex people needed another drill for bar work. Needless to say the Smith Machine Tool Co. got a repeat order, and at their quotation of \$92.50 f.o.b.—the difference being explained as due to the increase in price of materials and labor. Machine No. 2 was a duplicate of No. 1, except that a pair of fibre washers had been substituted in each case for the ball bearings to take the thrust of driving. On being interrogated, the Smith people declared this to be a late improvement, and offered every assurance that the second machine would do all that the first would, and possibly a little more.

Several months went by, and No. 2 failed to live up to expectations; only about three-fourths as much work could be turned out from it as from No. 1. Dressings for the frictions were tried, various lubricants used, driving belt was taken up, slip bushing put in a jig or two, but still No. 2 lagged behind. As stated before, the only structural difference between the machines was the thrust bearings. The Smith Co. was asked to send ball bearings for machine No. 2, but replied that they could not supply them.

Resourcefulness Victorious.

Now, the manager of the Middlesex Co., is a resourceful man, and a few weeks later dictated the following letter:—

"Kindly send me at once a full set of ball thrust bearings for the drill press which we purchased in 1909, and which have become badly worn. Yours, etc."

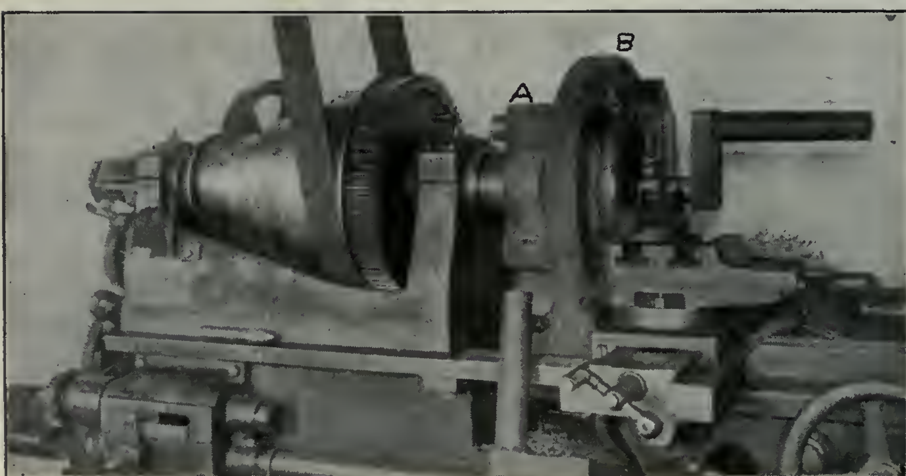
The parcel postman delivered them in three days, and No. 2 was immediately placed on the hospital list for the morning. Off came the offending fiber washers. About ⅛ inch was faced off the end of each quill to make room for the increase in thickness, and on went the ball bearings. Their outside diameter and their bore were both correct.

Machine No. 2 now does as much as No. 1, and has done so from the day the change was made. One cannot help wondering why the Smith Co. should retrograde in this day of ball and roller bearings.

CRANKSHAFT TURNING FIXTURE.

D. O. Barrett.

THE accompanying photo shows a fixture for holding single throw crankshafts such as are used for gasoline engines, while turning. The casting (A) is threaded to screw on the nose of the lathe spindle, being bored out on the one side with a counterweight of the proper dimensions for the shaft to be turned on the other. The end of the casting has a circular disc a little larger than the cheek of the crank, and about one and one-half inches wide. This portion is finished, and runs in the casting (B), which has four rollers. Casting (B) is similar to a steady rest, but it is a single casting. The four rollers are adjusted up against the piece (A) by backing screws, and then locked. By using rollers a ready means of adjustment is provided for any wear; for wear will, of course, eventually occur.



CRANKSHAFT TURNING FIXTURE.

The cranks are first rough turned one-thirty-second of an inch oversize. Piece (A) is split and arranged to clamp the shaft. It also has two posts carrying adjusting screws, which bear against the shaft at the centre, and will hold same against the heaviest cuts. The arrangement has proved to be ideal for this class of work, and cut down the time required to do these shafts by about one-third.

TESTING ELECTRIC MOTOR DRIVES.

By John Green.

ELECTRIC motors are beyond all doubt the best, cheapest and most convenient prime movers for woodworking machinery, and the direct-connected induction electric motor leaves little to be desired for driving woodworking machines.

The Overloading Feature

There is, however, another side to the electric motor story—a side which is sometimes neglected to the great delay of the shop, and sometimes such neglect causes costly repairs. The matter to be looked after is the overloading of motor drives. Electric motors are so designed that they will safely handle momentary and frequent overloads of 50 to 60 per cent. of their rated capacity, but that does not mean that a motor will safely carry such an overload all the time.

Overloading a direct-connected motor renders itself visible by sparking between brushes and commutator. When sparking is observed, which will not vanish by carefully adjusting the brushes and cleaning the commutator, then it is time to determine if the motor is working above its rated capacity.

Delivered Power Test.

Testing the power actually delivered by a motor is a very simple matter and very easily performed. All that is necessary is to connect into the circuit a voltmeter and an ammeter and take simultaneous reading from both instruments when the load is on the motor. The load may be roughly determined by using an ammeter alone and depending upon the nominal voltage of the line for the E. M. F. present when the ampere flow is determined.

A still better method of determining the power delivered by an electric motor is to cut into the circuit a recording watt-meter, which continuously records upon a revolving disk of paper the amount of work being performed by the motor under test. By drawing upon the disk circles representing horsepower, the observer can see at a glance the exact power delivered by the motor at each and any minute, while the watt-meter is thus connected up.

With the ammeter alone to determine the power, say 20 amperes were shown to be passing through the motor, simply multiply the number of amperes by the line voltage, and divide by 746. Should the line voltage be 220, then the watts consumed equals $20 \times 220 = 4400$, and $4400 \div 746 = 5.9$ horsepower nearly. Thus, should the test show 20 amperes to be passing through a 5 horsepower-motor, the machine is overloaded, and should be looked after.—Woodcraft.

FOUNDRYMEN'S CONVENTION PROGRAMME.

THE general committee in charge of arrangements for the Convention of Allied Foundrymen's Associations at Chicago in October is rapidly completing its plans, and the preliminary announcement of the programme of Convention Sessions and Entertainment has been made as follows:

Monday, October 13.

Registration.

Tuesday, October 14.

Morning: Joint session of American Foundrymen's Association and American Institute of Metals.

Address of welcome by the Mayor.

Responses.

Reading of general papers.

Afternoon: First professional session of American Foundrymen's Association.

First professional session of American Institute of Metals.

Wednesday, October 15.

Morning: Professional session, American Foundrymen's Association.

Professional session, American Institute of Metals.

Annual meeting, Associated Foundry Foremen.

Afternoon: Special North-Western Elevated train to Bismarck Garden from North Water Street terminal.

Thursday, October 16.

Morning: Professional sessions.

Afternoon: Professional sessions.

Evening: Annual banquet at La Salle Hotel.

The ladies' entertainment programme will include a luncheon at Marshall Field & Co.'s, Wednesday noon, and in the afternoon a matinee performance. On Thursday evening the ladies will be entertained at the theatre.

Arrangements are being made with a large number of plants in and around Chicago so that members of the Foundrymen's Associations may secure passes at the Convention Headquarters to inspect these plants either individually or in groups. The Hotel La Salle, Madison Street, is to be the general headquarters for the Convention.

DEVELOPMENTS IN MACHINERY

A Record of New and Improved Machinery Tending Towards Higher Quality and Economical Production in the Machine Shop, Blacksmith Shop or Planing Mill.

SHEET METAL WORKING MACHINERY.

THERE are here shown two new heavy pattern machines for working sheet metal.

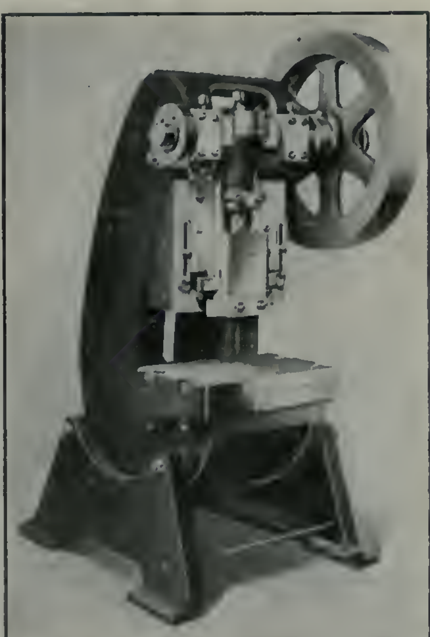
Fig. 1 is a power press of the open back inclinable type, and has capacity for exerting a pressure of 60 tons. The inclining device consists of a rack and pinion with worm and worm wheel for multiplying the power applied. One man can easily adjust the press to the inclined or straight position. The clutch pin is mounted in a steel collar forged solid on the shaft, and has a safety latch which automatically locks the pin, and makes it impossible to trip the press with the treadle when shaft is turned down for the purpose of setting dies.

The slide is provided with a knock-out bar, which is operated by two adjustable plates mounted on front of housing on each side of the slide. These plates can be tightened to suit the work in hand, and adjusted to slip under an overload, which would cause some part to break, if adjustment was positive. The brake band is adjusted under the tension of a spring, which automatically compensates for wear and for the expansion due to heat when running the press continuously. The crankshaft bearings in frame and the fly wheel are bronze bushed.

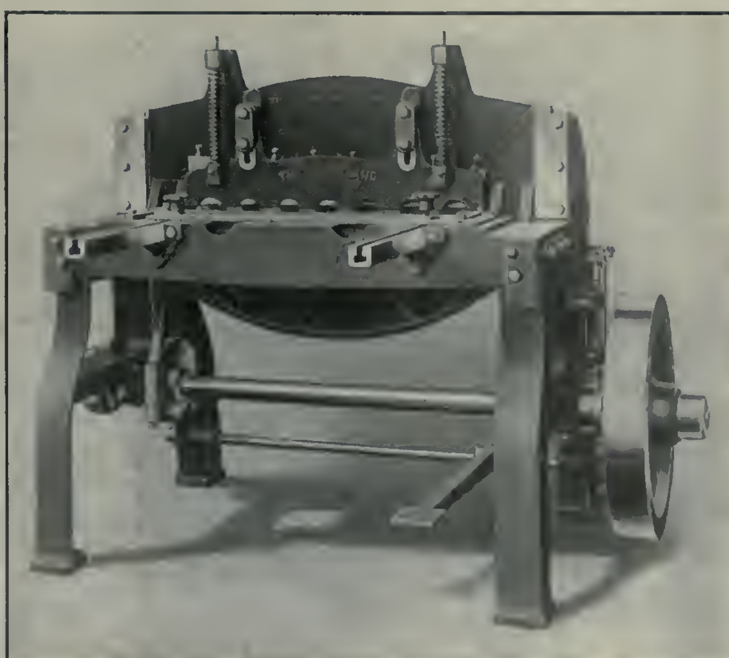
This press has a bed area of 27 in. right to left, by 18 in. front to back; distance back from centre of slide, 9½ in.; distance from bed to slide with stroke and adjustment up, 11 in.; thickness of bolster plate, 2 in.; standard stroke of slide, 2 in.; weight of fly wheel, 800 pounds; and total weight of machine, 4,400 pounds.

Plain Power Shear.

Fig. 2 shows a plain power shear with blades 31 in. long, and capacity for cutting No. 18 gauge steel full length. This machine has extra deep sections in bed and gate, and is designed for hard and accurate service. It has the same style of clutch as described for the press. The gate has a powerful spring hold-down, and the machine is furnished with a complete set of front, rear and side gauges. The weight complete is 1,250 pounds. Both machines are built by the Cleveland Machine & Mfg. Co., Cleveland, Ohio.



HEAVY PATTERN POWER PRESS.



HEAVY PATTERN PLAIN POWER SHEAR.

TEST OF TOWING LOCOMOTIVES.

TESTS of sample double truck towing locomotive, No. 640, conducted at Gatun Locks, demonstrated that the machine is not satisfactory in all respects. Under the proposal of the General Electric Co. to furnish a trial locomotive built from the Commission's design, and 39 others of the same type, if it should prove satisfactory, the Commission reserved the right to change to the alternative single truck design submitted by and bid on by the contractor. Award has now been made for 40 locomotives of the alternative type, with certain modifications, which the recent tests have shown to be desirable.

The principal defects found in the trial machine were, as follows:

1.—The unreliable action of friction intended to prevent the drum from turning until the desired pull had been reached.

2.—The narrowness of the winding face of the slip drum, which has the width of only two diameters of rope, and which, therefore, caused the layers of rope to overlie each other unevenly, and through violent slipping, to injure the rope, as well as prevent the use of as long a line as had been recommended by the naval advisor.

3.—The vibration due to the uneven surface of the rack rail against which the thrust wheels bear, and hold the locomotive to the track under the horizontal pull of the line.

4.—Failure of the pinion to engage without shock, in the approach racks placed at the point where the speed of the locomotives changes from the return speed to the towing speed.

Alternative Type.

Under the award, the contractor will furnish the alternative type of locomotive as originally proposed, inclusive of the following modifications:

1.—Omission of solenoid operating clutches and friction gear.

2.—Addition of hand operating clutches.

3.—Addition of equalized hand brakes.

4.—Fitting springs to thrust guide wheel.

5.—Change in windlass.

The above will make a net addition in the cost of each locomotive of $1,543, allowing for a deduction of $324 for each locomotive for omission of clutches. The total net cost of each machine under the award will be $13,217, or a grand total of $528,680 for the 40 locomotives.

The contractor has promised to make delivery of the first locomotive in seven months from the date of the order, and of the remaining 39, at the rate of four a month.

WORLD'S LARGEST PRECISION TESTING MACHINE.

THE illustrations show views of the testing machine which has recently been installed at the U.S. Bureau of Standards, Washington, D.C. This machine is used for testing columns, blocks, beams, girders, and other shapes of steel, iron, wood, concrete, reinforced concrete, etc., in order to determine the breaking strength, the spring under load, and other valuable engineering data. It is able to take specimens of any length up to 34 feet, and can exert a pull of 1,150,000 lbs., or a crushing force of 2,300,000, and yet so delicate is it that the pressure of the finger upon it will be registered.

The machine consists of two main parts connected by two enormous screws. One part (Fig. 2, and the remote end of Fig. 1) is stationary, and contains the mechanism by which the force exerted on the specimen is measured. The other part, called the press, is movable, and consists essentially of a hydraulic cylinder mounted on wheels. It will be noted that the head of the hydraulic piston is mounted on wheels of its own, and can move independently of the cylinder. The oil, which is used to produce the hydraulic pressure, is supplied through a pipe, which telescopes or elongates as the press is moved.

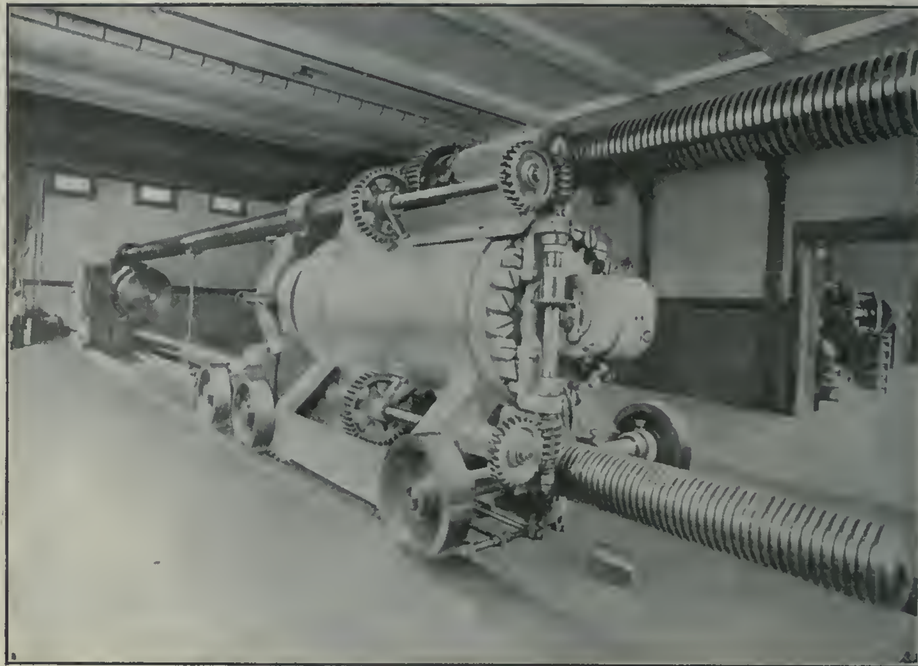


FIG. 1. THE WORLD'S LARGEST PRECISION TESTING MACHINE.

In testing, the press is moved to the proper point, depending on the size of the specimen, by the Westinghouse motor seen in the photograph. The specimen is then put in place, being gripped by jaws mounted on each of the ends of the testing machine, if it is to be put under tension, or held between two heavy plates if it is to be compressed. The hydraulic piston is then slowly forced forward or pulled back, depending on whether the test is of compression or tension, until the specimen under test is ruptured.

Fig. 3 shows the Deane pump driven by a 20 h.p. Westinghouse motor, which supplies the oil for operating the hydraulic cylinder. This pump is capable of delivering oil at a pressure of 3,500 lbs. per square inch.

HYDRAULIC FORMING PRESS.

ANOTHER new special hydraulic forming press, designed and built by the Hydraulic Press Mfg. Co., Mount Gilead, Ohio, is shown by the accompanying figure. It is used for forming various shapes from sheet metal or other material requiring a medium pressure.

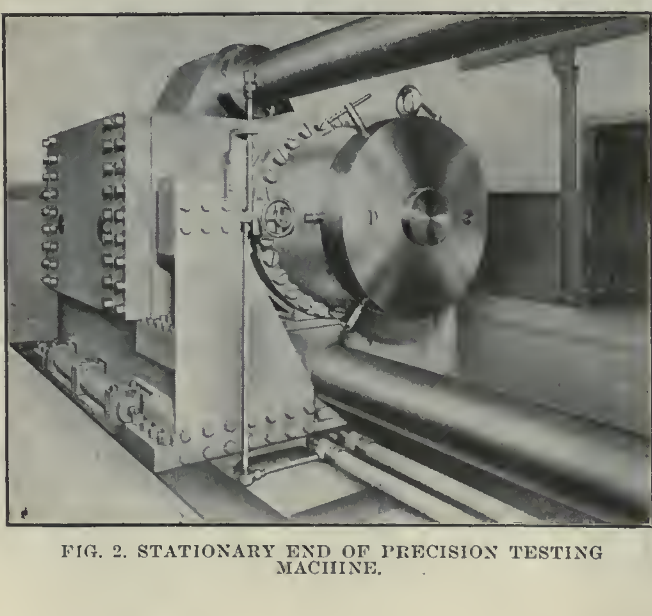


FIG. 2. STATIONARY END OF PRECISION TESTING MACHINE.

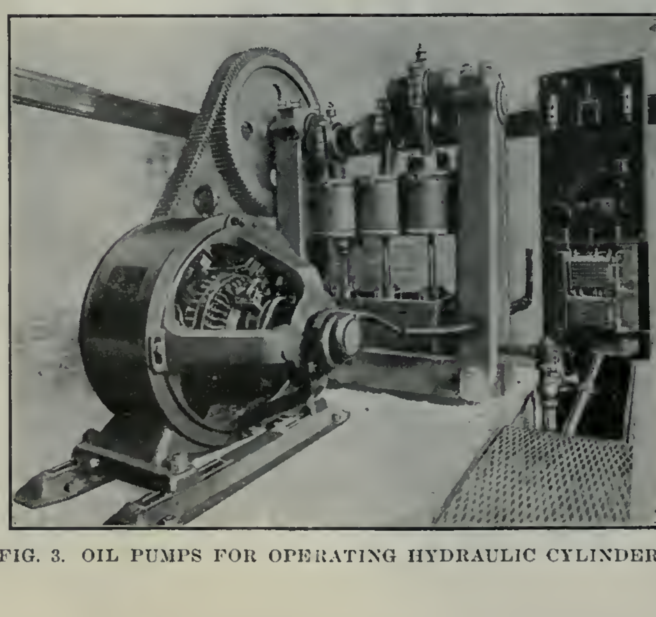
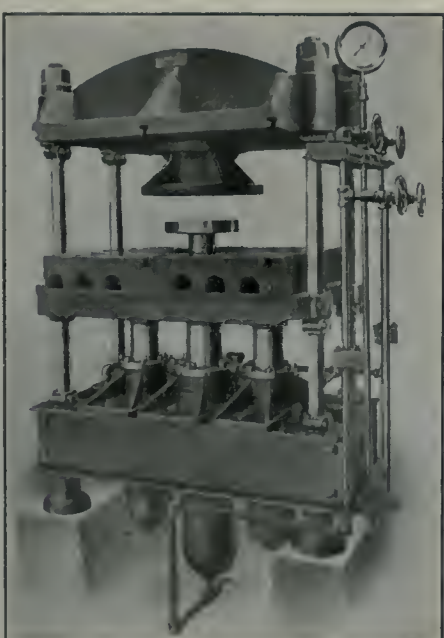


FIG. 3. OIL PUMPS FOR OPERATING HYDRAULIC CYLINDER.

Three cylinders and three rams are employed in operating the press. One 6-inch ram operates a blank holder, and two 5-inch rams operate the pressure platen. The centre, or 6-inch ram, is machined to a smaller diameter on the upper end than the bearing in its cylinder. The ram is not attached rigidly to the platen, and, during the first part of its operation, it travels in a bearing through the platen for a distance of 7 inches. Upon the completion of this travel, the shoulder on this ram takes a bearing on the under side of the platen, which causes the platen to travel upward. This causes the two side cylinders to fill by gravity from a surge tank.

When the platen and the main pressure ram is at the lowest point, the blank holding plate of the latter fits into a recess machine in the face of the platen. During the first part of the operation, the main pressure ram raises the blank holding attachment, and later carries up the main platen, as already described. It continues to move the blank holder and platen until the first operation is completed, when the operator turns the pressure into the side cylinders. This causes the platen to continue its upward travel free from the centre ram, and performs the second operation.

The extension pressure head can be removed for work not requiring it. The platen and pressure head are fitted with tee slots, and the pressure head extension with slots for bolting on different forms. The pressure capacity of the press is 68 tons, the pressing surface is 38 in. x 38 in., the daylight space 9 in. or 22½ in., and the run of the ram, 18 inches. The platen is constructed in a manner that will permit heating in necessary cases.

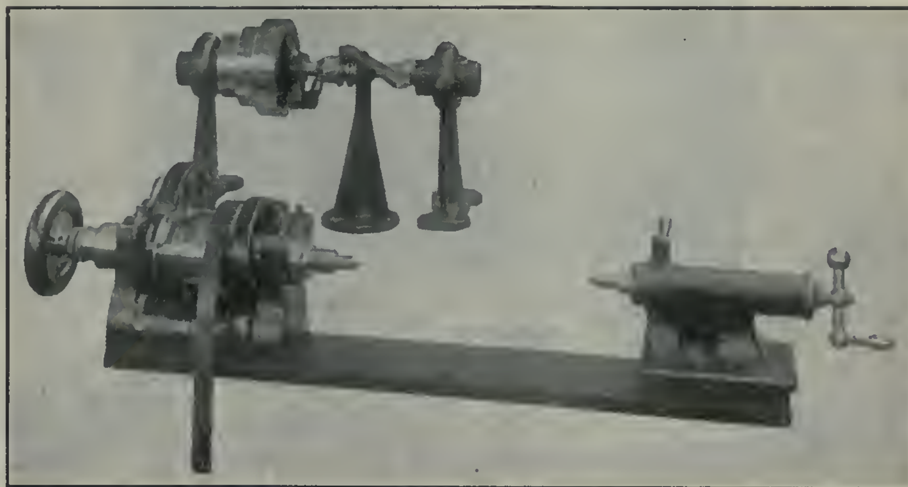


NEW HYDRAULIC FORMING PRESS.

BENCH LATHE FOR WINDING SMALL MAGNET COILS.

FOR such work as winding magnet coils, the W. P. Davis Machine Co., Rochester, N.Y., has developed a bench lathe. Although the machine was built for winding magnets for the electric starting devices used on automobiles, it may be available for similar work as may suggest itself on noting the details.

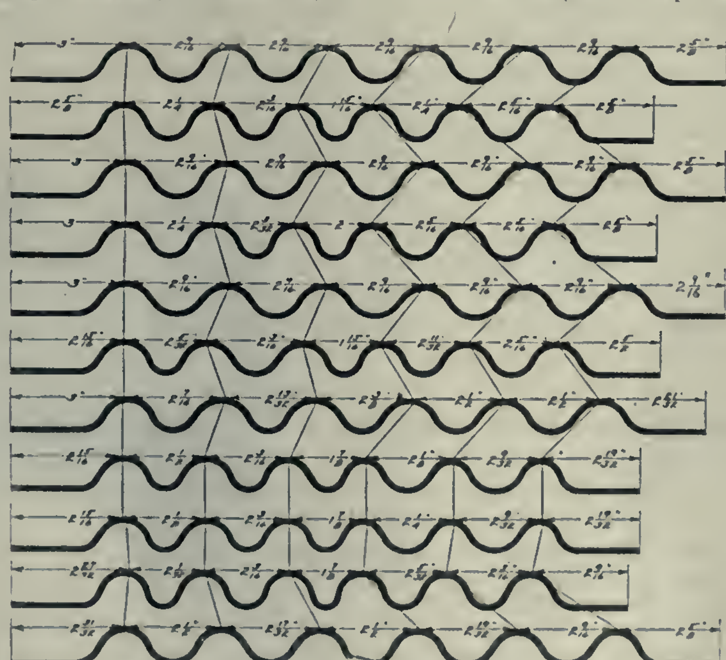
As indicated in the accompanying illustration, the lathe has a back-geared head with a left-hand thread on the spindle nose. For starting the work, and making necessary corrections, a handwheel is fitted to the rear end. The spindle runs away from the operator, and is driven by a countershaft placed on a bench at the rear of the lathe. A friction clutch is located in the cone pulley, adjusted so that it will slip when a brake consisting of a strap running over the large step of the cone pulley is applied by depressing a foot treadle. The lathes are built in four sizes, ranging from 11 to 18 in., the smallest being that illustrated.



BENCH LATHE FOR WINDING MAGNET COILS.

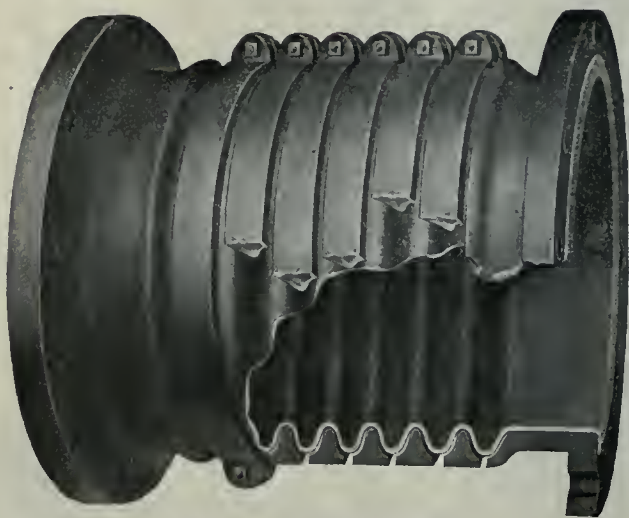
TEST OF A BADGER EXPANSION JOINT.

THE Badger Self-Equalizing Expansion Joint is distinctively a copper joint, corrugated for strength and for taking up the changes in pipe length. The external rings fitting the corrugations add strength to the joint and distribute the change of shape, each ring forcing a part of the change to the next so that the strain is divided among many corrugations, instead of being taken by one or two. It is evident that



TEST DATA OF A BADGER EXPANSION JOINT.

if the changes of shape are subdivided and distributed instead of concentrated the copper will last much longer. How well the Badger distributing rings pass along the strains, equalizing them among a large number of corrugations, is shown by a recent commercial test. The Badger expansion joint was sent for acceptance to a very large manufacturing concern, and having facilities not possessed by small companies, this large plant subjected the joint to searching tests. Approximate working conditions were available, and the accompanying figure shows the results graphically, the actual measurements being shown as well as the relative changes of shape.


BADGER EXPANSION JOINT.

The joint was a big one, 20 inches in diameter and 23¼ inches long between flanges. It had seven corrugations or depressions, and in order to have the joint heated nearly to working temperature it was filled with steam at about five pounds pressure. For testing, the joint was secured at one flange and shortened the desired amount by bolts. In this manner, the joint was shortened as it would be when squeezed together by the increase in length of two lines of pipe.

CINCINNATI TOOL ROOM LATHE.

THE illustration and descriptive text refer to the latest tool-room lathe put on the market by the Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio. In its general features, this machine follows the lines of an earlier product, except that an oil pan and pump form part of the design and equipment.

The headstock is of the double back geared type with three-step cone pulley, designed for a 3¾-in. belt. The back gear quill is of steel, and is bushed at both ends with bronze. A sleeve is mounted on this quill for shifting the double back gears, the motion being transmitted from the front of the machine.

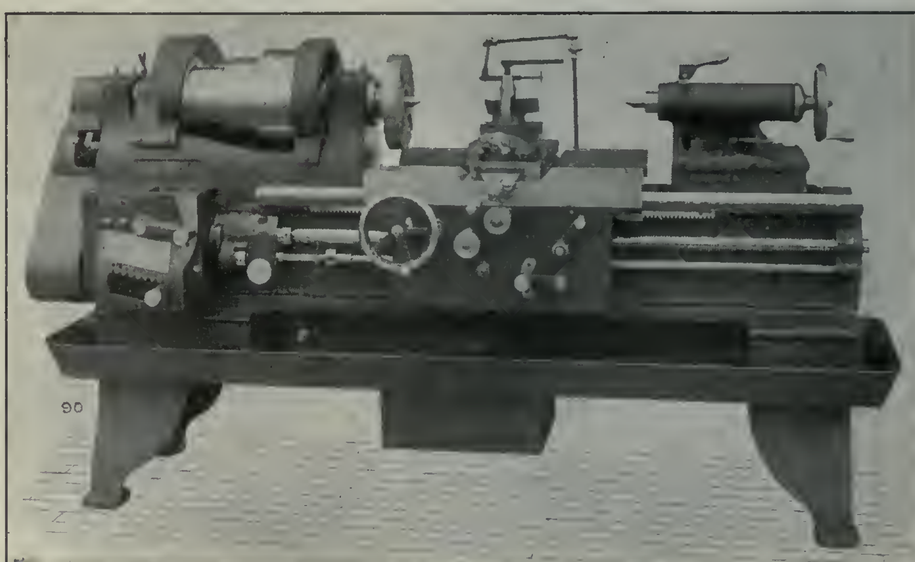
A double wall apron of the box type is bolted rigidly to the carriage, thus giving a double support to all the shafts and studs mounted on it. Motion is transmitted by compound gearing to the steel rack pinion located close to the rack on the bed. The longitudinal and cross friction feeds can be started, stopped or reversed while the lathe is running, but cannot be engaged when cutting screws.

A thread chasing dial, which forms a portion of the lathe equipment, allows the carriage to be run back by hand, and the thread to be caught or picked up at any point without reversing the lathe, after the half nuts are opened. A reverse plate, which is mounted on the outside of the headstock, is used for reversing the lead screw when threads are being cut, the feed reversing mechanism being located in the apron.

A quadrant at the end of the lathe enables extra or metric pitches to be combined with the regular U.S. standard lead screw, in addition to those provided in the gear box, by simply shifting two levers. These changes can be made while the lathe is running under a heavy cut, and in addition to cutting the pitch required, each gear will also cut others through the series of gear box changes.

The screw cutting and feed mechanism is assembled as a complete single unit in a box mounted on the front of the bed, and an index plate attached to the box enables the operator to see at a glance the correct positions of the two levers for any thread or feed. Another convenience of this arrangement is that the two levers are placed but a few inches apart. The lathes can be fitted when installed, or at any time afterwards, with draw-in, relieving and taper attachments.

We have been advised that, about two weeks ago, one of the above lathes at work in the maker's shop negotiated successfully a ¾ inch cut when operating at 80 feet per minute, and that accuracy to within .001 of an inch is their guarantee.



CINCINNATI TOOL ROOM LATHE WITH OIL PAN AND PUMP.

INFORMATION FOR INVENTORS.

Pigeon, Pigeon, & Davis, patent solicitors, Montreal, report that 125 Canadian patents were issued for the week ending August 19, 1913, of which 80 were granted to Americans, 21 to Canadians, 12 to residents of Great Britain and Colonies, and 12 to residents of foreign countries. Of the Canadians who received patents, 10 were residents of Ontario, 6 of Quebec, 1 of Nova Scotia, 1 of Manitoba, 1 of Saskatchewan, 1 of Alberta, and 1 of British Columbia. In the United States, for the same week, 630 patents were issued, 7 of which were granted to Canadian inventors.

TRADE AND COMMERCE RECORD

Dealing With the Steps Being Taken and Progress Made by Industrial Canada To Achieve and Maintain a Dominant Place in the Markets of the World.

BRITISH MANUFACTURERS SHOW TRAIN.

WORD has been received at C.P.R. headquarters that it is the intention of the Canadian Chamber of Commerce in London to emulate the example of the Canadian manufacturers, and run a train through Canada which will be loaded with English manufactured products. The excellent success which this venture met with in Canada on behalf of the Canadian manufacturers has led to this move by their English brethren.

CANADA'S TRADE WITH UNITED STATES.

THE United States ranks first as a caterer to Canada's needs and second as a customer of the northern country's supplies, says a report by the Bureau of Foreign and Domestic Commerce. Canada buys more from the United States than from all others combined, having purchased 65 per cent of its goods here last year.

The United States, in 1912, took from Canada 38 per cent. of that country's exports, while to-day, says the report, it takes almost the entire export of Canadian minerals of all kinds, the bulk of its forestry exports, more than half of the manufactures it sends out, and a third of its fishery exports.

In spite of tariff preferences, it adds, Great Britain's share of the Canadian market has steadily declined before the advance of American goods, geography having been too much for tariffs.

CANADA'S PUBLIC DEBT.

DURING August the net public debt of the Dominion increased by $3,681,217, as compared with a decrease of $3,097,926 in August of last year. The net debt now stands at $301,750,895 as compared with $298,009,678 at the end of July.

Expenditure on consolidated fund account for the five months ending with August totalled $39,428,572, an increase of $4,077,435, as compared with the corresponding period of the last fiscal year. Expenditure on capital account for the five months totalled $20,215,144, an increase of $11,513,977 over the corresponding period of last year. The increase includes nearly eight millions in railway subsidies, representing, largely, amounts paid 'on account'' to the Canadian Northern Railway Co., in conformity with the seventeen million subsidy grant of last session.

Revenue for the five months totalled $71,628,457, an increase of $4,725,290, of which $1,626,968 are due to increased Customs collections, $500,000 to growing post office revenue, and $419,435 to Excise, representing increased production of liquor and tobacco.

AMERICAN STEEL COMPANIES' ORDERS.

AMERICAN Steel Companies received some encouragement in August, especially during the second half of the month, from large orders for rolled steel products from manufacturing industries for delivery over periods of six months to one year. From a tonnage standpoint there was a gain of 30 per cent., but prices were lower, and consequently profits were somewhat reduced, but it may be that the increased volume of business compensated for the lower prices. Interest was stimulated, too, by the concessions made by the mills, and there is still considerable buying by consumers in all sections.

The light orders received from the railways for equipment and other supplies was the one discouraging feature. It seems only a question of a short time, however, before substantial railroad contracts are placed. In August, the total volume of business derived by the mills for railway purposes was little more than 165,000 to 170,000 tons, made up of a little over 60,000 tons of rails, 60,000 tons for 4,250 cars, and 10,000 tons for 100 locomotives, as well as 28,000 tons of structural and bridge material.

A £2,000,000 STEEL COMBINE.

A SYNDICATE of well known Glasgow capitalists have just formed a new iron and steel corporation under the title of the Simpson & Oviatt British Iron and Steel Corporation, with a capital of £2,000,000. The company will carry on the business of iron and steel manufacturers, in addition to shipbuilding, mining and construction of railway plant. The firm of Biggart, Lumsden & Co., of Glasgow, members of the Shipbuilding Employers' Federation, are interested in the formation of the company.

REPRESENTATION AT NATIONAL EXHIBITION.

MR. RHYS D. FAIRBAIRN, speaking on the occasion of a Canadian National Exhibition luncheon, said that manufacturers should reserve more space at the exhibition. The large concerns should not be allowed to crowd out the smaller ones, as the former would be the large industries of the future.

The banks had been criticised, but the manufacturers had found that they could get all the money they required for legitimate purposes. The development of the export trade was linked up with transportation, and Canada should have a national railway. He was sure that one of those now building could be bought out.

EASTERN CAR COMPANY.

UNDER date of September 3rd, a despatch from Nova Scotia says: The Eastern Car Company have completed their sample steel box car, and the company's mammoth plant may now be considered as having gone into actual operation. The major portion of the construction work is finished, and cars will be shipped daily. All of the necessary material is now on the ground with everything running smoothly.

Five hundred and sixty men are employed at present, but this number is being steadily increased as fast as others with the requisite skill can be obtained.

MONTREAL PORT REVENUE DECREASES.

FOR the first time during the present financial year Customs and Inland Revenue returns show a falling-off as compared with the month of August, 1912. The decrease in the Customs revenue amounts to $49,193.73, the receipts having totalled $2,269,678.57, as compared with $2,318,872.30 for August, 1912. The decrease in Inland Revenue amounts to $37,863.30, the receipts having been $871,265.54 for August this year, as compared with $909,128.84 for the corresponding month of last year.

Enquiries made at the Customs House and of officials of the Inland Revenue Department tend to show that too much importance may easily be attached to this temporary check, and that it would be premature to contend that there is any diminution of the prosperity of the port to be apprehended in the near future.

There was one working day less last August than in August, 1912. The decline in Inland Revenue has also been partly due to a falling off, apparently only of a temporary nature, in receipts from the importers of cigars.

GOVERNMENT CONTRACTS AWARDED.

A NUMBER of contracts were awarded at the meeting of the Dominion Cabinet on September 3, which was the most largely attended for some months.

The York Construction Co., of Toronto, was given the final contract on the Trent Valley Canal. This is the Seven River section, and the contract price is $130,273.

Other new contracts are:

The Northern Dredging Co., dredging at Cheticamp, N.S., $15,000.

The Standard Construction Co., wharf at Hautsport, N.S., $18,685.

Quinlan & Robertson, Montreal, rebuilding head of the Grand Pier Canal, $24,283.

The Hamilton Bridge Co., steel bridge over the Chambly Canal, Larocques crossing, $2,450.

The Hamilton Bridge Co., double track railway swing bridge over the Welland Canal, $65,800.

A. G. Marshall, Ottawa, installation of underground services in the House of Commons, $11,995.

Jackson and Goldie, thirty additional targets on the Winnipeg rifle range, $19,500.

GRAIN VIA VANCOUVER.

IT is claimed that Vancouver will be an important grain-shipping port after the opening of the Panama Canal, when reduced water rates are available. Canadian grain shipments at the present time via the Great Lakes are hampered by the short season.

While heretofore it has been necessary to ship over the Eastern route, with the completion of the new roads to the West, and the opening of the Panama Canal, it will be necessary that exceptionally low rates be offered the shippers of the Western Provinces, such as Alberta and Saskatchewan, in order to induce them to ship via the Eastern route. It is claimed by some that grain shipments through the Panama Canal from this point are impractical on account of the liability of the grain to sweat owing to the heat to be encountered on this route.

The advantage of the Western route becomes more apparent when it is taken into consideration that the Panama route from Vancouver to Liverpool will be cut to 8,800 miles, as against 14,000 miles by way of the Straits of Magellan, and more than 16,000 miles by way of the Suez route. In fact, the time will be practically cut in half. It has been estimated that the entire crop of grain of British Columbia and Alberta and one-third of the crop of Saskatchewan will be exported by way of Vancouver, either in the shape of grain or in manufactured form. The production of this area for 1912 amounted to approximately 179,330,836 bushels, and this production will be increased upon the opening up of new parts of Canada by the completion of the Transcontinental railroads now under construction.

ANOTHER GRAIN ROUTE.

IT appears now to be certain that the Canadian Northern Railway will be prepared to haul grain over its new transcontinental line from Port Arthur to Sudbury, and then south to Toronto by the beginning of winter. This will be fortunate, inasmuch as, according to such authorities as Mr. John Aird, assistant general manager of the Canadian Bank of Commerce, and many others, the crop movement will be larger this fall than it has ever been before. The fact of another grain route being opened from the West to the East does not necessarily, however, preclude the possibility of another grain congestion at the head of the lakes this year.

It is important in this respect to note that with the opening of the grain route the Canadian Northern Railway will be able to carry their traffic from British Columbia to the Atlantic by its own right of way. As the route east of Sudbury is not completed, all traffic must necessarily pass through Toronto. This new line is constructed with a view to its carrying heavy traffic.

GRAIN TRANSPORTATION AND ELEVATOR STORAGE.

THE Quebec Board of Trade has addressed an important document to the Right Hon. Mr. Borden on the question of Canadian grain transportation and elevator storage capacity at the various Canadian ports.

The document has been inspired by the report made from investigation by the Montreal Harbor Commission, which the Quebec Board of Trade endorses, but at the same time points out the expense and great delay in deepening the Welland Canal when the remedy is at hand by the completion of the Transcontinental Railway, which will be finished within a year, and will handle Canadian grain for twelve months in the year instead of six by the canal route.

The document further shows that the Custom ports of Montreal, Quebec, Halifax and St. John have at the present only 12,000,000 bushels elevator capacity, and each port at least should have grain elevators built to gurnish a capacity of 15,000,000, which would put an end to the diversion of Canadian grain through American ports.

MONTREAL FIRM GETS BIG CONTRACT.

THE contract for section three of the new Welland Ship Canal was let at a Cabinet Council on September 4, to the firm of O'Brien & Doheny, of Montreal. The contract price is $9,540,050.

Section three is the most difficult in the plan of the new canal. It extends over something more than two miles at the town of Thorold, and its construction necessitates a great deal of rock excavation. There are three locks in this section. The firm of O'Brien & Doheny is composed of Mr. M. J. O'Brien, of Renfrew, and Hugh Doheny, of Montreal.

The first section of the new canal along Ten-Mile Creek from Lake Ontario is already under contract to the Dominion Dredging Co. Section two will be advertised for this week.

A contract was also let to-day to J. T. Horne for dredging in Rainy River to cost $29,250.

SHIPBUILDING PLANT FOR NORTH SHORE.

THE new dry dock to be built by the Federal Government will be built at North Vancouver on Burrard Inlet. The outlay will amount to $4,000,000, and will cover the cost of constructing the largest shipbuilding dry dock and ship repairing works in Canada.

The plant will cover 80 acres, and when in full operation will give employment to over 2,000 men. The basin will give a depth of 30 feet at low tide, and the floating dock will have a lifting capacity of 20,000 tons. The plant will take three years to complete. The contract is in the hands of the Amalgamated Engineering Co., of which Sir Henry Pellatt, Sir J. M. Gibson and D. B. Hanna, all of Toronto, are directors.

PETROL SUBSTITUTE FOR AUTOMOBILES.

A DISCOVERY which it is claimed will revolutionize the motor spirit industry and make Great Britain partly independent of foreign supplies is announced by a joint committee appointed some time ago by the Royal Automobile Company and other automobile associations. The secretary of the committee says they tested a substitute for petrol, which is a by-product of coal, and which hitherto has been unsuitable as motor fuel. The expert of the commission made the fullest investigations, with excellent results.

A big commercial plant is now being built, and indications are that, when the process is fully going, forty million gallons will be produced. It can be sold at 28 cents a gallon, as comparred with the present price of 42 cents. It is figured that the present British consumption of petrol is 100,000,000 gallons a year.

CANADA'S BALANCE OF TRADE.

DR. JAMES BONAR, of the Canadian Mint, read a paper on "Canada's Balance of Trade" before the Canadian Political Association.

Canada has what used to be called an unfavorable balance of trade, said Dr. Bonar. That is where imports exceed exports. With Canada, however, this was a healthy unfavorable balance. The Dominion had for the last ten years been borrowing municipally from England about $200,000,000 per year. This big indebtedness, particularly that of Canada's debt to Britain, was difficult to account for, since the British Empire as a whole sent us nineteen and a half millions less than it received. There was only one country, the United States, which would account for this amount, a country which in 1911 exported to Canada about $170,000,000 more than she imported.

The Ins and Outs.

From all of this Dr. Bonar drew the conclusion that American trade was financing English loans. That is, English money was given to Canadians and used to buy American goods. Not only did the loan depend on the American trade for the machinery of delivery, but, to the amount concerned, it created the American trade. When Canadians did anything to increase the price of American articles purchased, they increased the cost to themselves of their own supplies, and thereby lessened the effective amount of the loan itself. The standing of the three countries was this:

England was increasing her claims for interest even faster than her granting of loans, hence an unfavorable balance excess of imports. Canada was increasing her debts faster than her payments of interest, hence the same condition of affairs. The United States were increasing their payments of interests faster than their borrowings, hence a favorable balance excess of imports.

The effect of the introduction of American capital to establish business here was similar to the effect of an English loan to help us establish our own, said Dr. Bonar. Such a continuous invasion of another country, as that of the Americans here, was a new thing in economic history, and was far more important than the effects of it on the balance of trade.

NEW ELEVATOR NEARING OPERATION STAGE.

THE new million-bushel Grand Trunk elevator will surely be in operation by November 15," was the statement of Mr. George Hanna, manager of the Montreal Warehouse Co., a few days ago.

"You can rest assured," continued Mr. Hanna, "that there will be no hitch to prevent everything being in the best of running order on that date, and we will be glad to handle double the amount of grain during the coming year, which we did last.

"The system of building has been made to conform, in every way, with the present and future needs of the grain trade for both local and export account. No machinery outside of carriers for elevating and carrying grain to different parts of the twenty-eight bins will be installed in the new elevator, and for this reason we will have no mechanical apparatus to instal to hinder the completion of the structure, and prevent the needed extra storage capacity being put at the disposal of our patrons on the date mentioned."

CANADIAN TRADE.

DESPITE the report of financial stringency throughout the country, Canadian trade reached high water mark for the month of July.

A statement issued by the Department of Customs, recently, shows that for July the total Canadian trade was $100,357,000, compared with $91,423,000 for July, 1912.

For the first four months of the present fiscal year ending July 31, the total Canadian trade amounted to $358,488,000, compared with $328,635,000 for the corresponding period last year.

At the present rate of progress, the trade of Canada for the present fiscal year will considerably exceed the record of one billion for the last fiscal year.

Imports into the Dominion of durable goods and free goods for July amount to $58,928,000, an increase of over $2,000,000 over July 1912.

For the four months ending July 31, the imports were $225,887,000, compared with $209,334,000 for the corresponding four months of 1912.

The duty collected for the four months of this fiscal year was $38,531,000, compared with $35,990,000 for the previous period of 1912.

The exports of Canada show a healthy increase. Agricultural products for July last were $11,497,000, as against $10,251,000 for July, 1912. For the four months of the present fiscal year the exports of agricultural products were $51,622,000, compared with $47,221,000 for the first four months of the fiscal year, 1912.

The grand total of exports for July last were $33,660,000, as against $31,042,000 for 1912, and for the four months of the present fiscal year the exports are $117,180,000, compared with $107,308,000 for the corresponding period last year.

PORT OF MONTREAL.

THE number of ocean steamers arriving in Montreal month by month is continually increasing, as compared with previous years. Arrivals during August numbered 72, as compared with 56 for August, 1912, and their combined gross register tonnage was again not far short of the half-million mark, being 472,765 tons.

The total number of ocean steamers which have arrived in port since the opening of navigation to August 31 inclusive, is exactly 300, as compared with only 245 for the similar period last year. Taking April and May together this year, the number of arrivals up to May 31 was 76, as against 73 last year, when navigation was later opening. During June the numbers were 81 this year, and 54 last; during July, 71 this year and 62 last; and for August, as stated, 72 this year and 56 in 1912. The increase, as will be noted, is not at all sporadic, but steady and well-maintained.

Of the 72 ships arriving during the past month, 13 were Allan liners, one an Austro-American liner, 5 C.P.R., 3 Canada liners, 3 Direct, 4 Dominion, 4 Donaldson, 1 Elder-Dempster, 5 Furness, 3 Head liners, 4 Manchester, 1 New Zealand, 3 C.N.R., 6 Thomson, 4 White Star liners, and 9 tramp steamers. The last named is a class of steamer that will show a marked increase compared with former seasons when this year's returns are made up.

$90,000 DREDGING CONTRACT.

THE Sault Dredging & Construction Co. of Sault Ste. Marie have been awarded the $90,000 contract for dredging the channel between Goat Island end Little Current on Manitoulin Island, to a depth of 22 feet. The largest freighters on the lakes will then be able to dock at Little Current, and it is probable that the dredging is but the first part of a big programme of terminal facilities at that point.

The Lure of the Machinery Hall at the 1913 Exhibition

Staff Article

Being an account of things and men, at the Canadian National Exhibition, Toronto, who attracted unusual attention in the Machinery Hall, but laying no claim to cover the big field or all the exhibits found inside that building.

TO thousands of people in Ontario the Machinery Hall at Toronto Exhibition provides an opportunity to get in touch annually with the many utilities on which they are so dependent, and yet understand so little. To the average man it is a most uninteresting affair this Machinery Hall, but he usually takes it as he does his annual bath, as something that should be gone through at least once. One wonders what all those people who pass through this section of the Exhibition find to interest them in roll after roll of leather belting, etc. There are some wiser than the others, who know that the average man will stop and look at something spectacular, even when the mind fails to grasp the meaning of it; so The Canada Metal Co., with their tiers of babbitt and other metals, attracted big crowds by means of an electrical display portraying a workman pouring babbitt metal.

Then the electric welding machines and the experiments conducted by L'Air Liquide Society were great attractions. Of the former, The Fisher Motor Co., of Walkerville, and the Chapman Ball Bearing Co., Toronto, each had one, while, on the latter, experiments were conducted behind blue sheet glass, so as not to injure the eyes of spectators.

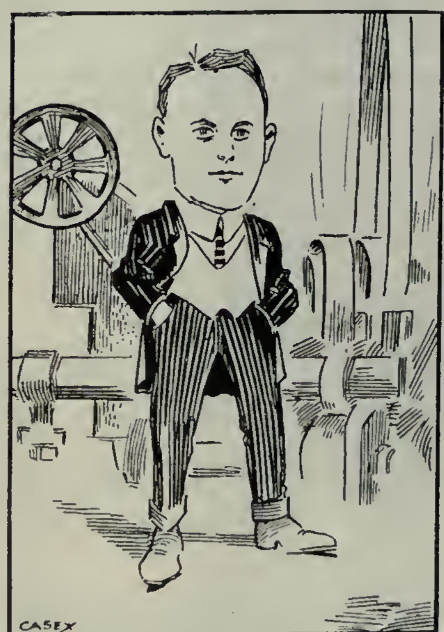
Things Brand New.

Of things brand new in the Machinery Hall, the newest was probably a Brown, Boggs press, equipped with a universal safety device. It was operated in the A. R. Williams Co. section by the inventor, J. Wright, a Hamilton man, and a first-class mechanic. He is superintendent of the E. T. Wright Co., Ltd., Hamilton, makers of tinware and galvanized iron products. He, with William S. Stacey, will superintend the manufacture of these machines. This is the first on the market, and was rushed specially for the Exhibition. The invention is simply a device to save the operator's fingers, and is very effective.

Electric Welders and Ball Bearings.

The chief exhibit of the Fisher Motor Co. was an electric welder, which opens wide the mouths of country visitors. It is difficult to figure out who is the Fisher Motor Co., since they have not been in this world long. The electric welder is the product of Fred W. Vollans, a prominent Walkerville engineer, who originated the F. W. Vollans Machine Co. The Fisher Motor Co. are manufacturers of motor trucks, and as this company was reported last week to have bought out the Tudhope Motor Co. of Orillia, Ont., their products will now number three. Both F. W. Vollans and Frank E. Fisher were at the "Ex." at various times. The electric welders were in charge of W. H. Smith. He reported giving exhibitions to spectators, who turned out to be clever American engineers, and were in Toronto simply for what they could pick up in the way of ideas. Other exhibitors have remarked this.

The Chapman Ball Bearing Co. secured as advantageous a position as there was in the building, and made good use of it. Besides the customary display of steel balls forming the word Chapman, there was an electric welding machine in charge of Mr. Agnew, of the Canadian Welding Co., Walkerville, Ont., used for making the cages in which the balls are housed. W. J. Murray was in charge.



TOM REID IN THE A. R. WILLIAMS CO. BOOTH.

Machine Tools.

If the exhibit of the A. R. Williams Co., of Toronto, had been taken out of the Machinery Hall there would have been a big vacant spot, and one of the most interesting exhibits to the man in the street would have been lacking. This was the demonstration on a Warner & Swasey universal hexagonal turret lathe. Frank Castle travels around with the company's machines, and it was he who gave a special show on chucking work at the "Ex.," demonstrating how work could be done in 20 minutes which would take two hours and a half on an engine lathe. W. E. Marshall represented the firm of Warner & Swasey, and T. P. Burton was in charge of Williams' exhibit, which was very extensive. Messrs. Williams, Hollinrake and T. Reid paid visits to the Hall when circumstances permitted them.

A colored boy was employed by the Borden-Canadian Co., Toronto, to show the visitors how easy it is to operate their die stocks. He was a sort of help to J. Monaghan, who was in charge. Some old farmers found they were not so strong as the colored boy.

There was a line of shafting carrying immense pulleys in the Canadian Fairbanks-Morse Co. booth, but where the power to operate this came from no one could make out. To those who made enquiries, R. H. Noble, who was in charge, pointed to a sixteenth of a horse-power motor, connected by a piece of string. He added that the shaft was two inches out of line, but this was taken care of by the self-aligning feature of "Skefko" ball bearings, on which it was running.

When an artist on the staff of "Canadian Machinery" stood near the booth of the Canada Machinery Corporation and commenced making a few graceful curves in his notebook there was a figure appropriately enough pointing out the good qualities of a shaper. When it was all over, he saw the artist, and moved away. It was the modest A. M. McGill, Toronto representative of the C. M. C. He was in charge of the exhibit during the week, and was aided at various times by several others from the shops at Galt. Among those noticed around were B. H. Niel, purchasing agent; V. Boyd, sales manager, who called on Saturday, and "Bill" Baird. the South-west Ontario representative, who has been twenty-one years with the company. Besides a number of woodworking tools, Mr. McGill was showing a 20 x 12 engine lathe, and a 24 x 30 shaper. He remarked that several American machine tool men had visited the exhibit, and had expressed surprise that such fine products could be turned out on this side. Incidentally, the C. M. C.

WHAT IMPRESSED CASEY IN THE MACHINERY HALL OF THE CANADIAN NATIONAL EXHIBITION.

is turning out a lathe per day, and is not grumbling at poor trade.

Machinery Accessories.

Crescent belt fasteners were to be found at almost every booth in the hall where belting was on sale, but the makers had a special representative at the booth of W. A. Martin & Co. in the person of Herbert Walker. Mr. Martin used to represent the Canadian British Engineering Co., Ltd., in Toronto, but has now taken over that concern's operations for the whole of Ontario, and will open new premises at 70 Lombard Street, carrying a full stock of tool steel, electrical equipment, gas engines, leather and Gripoly belting, Graton & Knight belting, and air compressors. Associated with Mr. Martin is W. R. Green, the sales manager, a young American engineer of great promise. He was in charge of the firm's booth.

The Garlock Packing Co. of Hamilton drew the attention of the passers-by by means of a supply of Keystone grease circulating in a motor car gear box, run by a small electric motor. H. G. Fletcher represented Garlock, and in the same booth was a supply of Lunkenheimer engine specialties, in charge of E. A. Wilkinson.

Kester T. Barr, manager of the Lumen Bearing Co., Toronto, was a familiar figure at the "Ex.," his firm having a splendid exhibit of drop forgings. J. K. Young, master mechanic of the die casting department, did considerable explaining, astounding the farmers with his marvellous figures. "No machine work," he explained; "just as it leaves the die, and true to a thousandth part of an inch. The metal is subjected to a pressure of 200 lbs. to the square inch." And so on.

J. B. Faatz represented Cling-Surface Co., Buffalo, N.Y., and his catch was a lifebelt bearing the words: "Cling-Surface life-saver for belts." Not a bad idea.

John F. Haas wasn't giving anything away, but he would spend his valuable time explaining how Dodge pulleys were made, and how they were superior to other makes. Incidentally he was not the only one there in this line. The Positive Clutch and Pulley people had a booth, and Reeve's pulleys were shown in the A. R. Williams exhibit.

The Canadian Pneumatic Tool Co. did not excite much interest in their electric headlight for locomotives. Truth to say, there were not many people there who used locomotives, but J. B. Wilson, the Ontario representative of The Holden Co., Ltd., did his best to educate the spectators in the use of electric and compressed air drills. He also had a new portable electric grinder for engine cylinders, just on the market.

W. D. Beath, maker of cranes and runways, was present in person at the Exhibition to show his wares. He found more farmers than foundrymen looking around, but there were quite a number of the latter who were interested in his well-known creations, some of which are quite new. W. D. Beath caters to such a wide trade, that he was kept continually on the go.

There were plenty of others at the "Ex." of greater or lesser note. There was Mr. De Milt, of the Perolin Co. of Canada, looking like a druggist with his bottles, showing to groups of eager spectators how Perolin saves the boiler flues. The Dearborn Chemical Co. had a representative there for the same purpose.

Humorous Side to the "Ex."

Quite a lot of people who visit the Toronto Exhibition go there to see what they can pick up in the way of samples. It is rather difficult for machinery men to oblige them in this. Lathes, belting and cling-surface are not handy things for souvenirs; but there was one man in the Machinery Hall who did give away souvenirs. Whenever a visitor asked for something along this line, he or she was generally directed to a certain booth. "Do you give anything away?" was the question usually put. "Yes," replied the machinery man, "I have some ladies' coat hangers. Will you take one?" Nobody ever refuses a coat hanger, so the reply was in the affirmative. The Machinery Hall rocked with laughter every time a couple of six-inch nails were handed over.

Something went wrong with the clothing of one of the lady visitors as she passed through the Machinery Hall. Whatever it was, it worried her considerably. When she and her escort arrived at the booth where a certain famous leather belt fastener was being boosted, a splendid idea struck her. Leaning over to the attendant, she asked if these fasteners were for ladies' belts, and could they be attached to the hose? The engineer blushed, and quietly explained the situation.

The machinery men were genial fellows on the whole, but one there was among them handy with his fists and of unusual physical proportions. He went out for dinner, and ordered fish as a side. He made sure from the waitress that fish was not an extra, but when the meal was over an extra ten cents was charged. The caterer made an effort to secure the dime, and only relaxed his efforts when the machinery man threatened to clean up the show.

J. K. Young, of the Lumen Bearing Co,. was giving away exact reproductions of locomotive bearings, one-twentieth of the original size. Visitors were told to put these in their pockets, as if they lost themselves these would enable them to find their bearings again.

By the time nine o'clock p.m. was reached, most of the booths in the machinery section were vacant. There were spectators, however, who lingered around until ten o'clock looking for sparks flying, and wondering why the electric welders were not at work. At that hour an officious little man, backed by a couple of policemen, came around and bustled everybody out, no matter how important the business being done.

STEEL BELTS.

WHEN most manufacturers and owners of factories are looking for new methods of reducing the ever-increasing initial costs and getting a better return for any outlay, says "The Engineer and Iron Trades' Advertiser," it is not surprising that the potentialities of steel belt transmission in these directions are beginning to be appreciated. Though more than six years have passed since the "Eloesser" system was introduced on the continent of Europe, and over 100,000 h.p. has since been installed there, it is only lately, that a few of the more daring firms have ventured to adopt the system.

The belts are made from a specially hardened charcoal steel prepared by a secret process, and the finished material has a tensile strength of 95 tons per square inch. The length of each belt is constant, and no subsequent readjustment is required. Thicknesses vary from .2 to 1 mm., and the widths from $1\frac{1}{2}$ in. to about 8 in., according to working conditions and the maximum h.p. to be transmitted. The tension required on the belt over flat or rope converted pulleys is determined by a special patented instrument, and only one flexible steel joint—designed so that its rigid portion does not hinder transmission—is necessary.

Since being perfected, no breakages have occurred at this joint, indeed the only breakages (caused mostly through faulty alignment of shafting or pulleys) during a whole six years' running have been less than one per cent. over all the installations. Once tension requisite to transmit the required horse power is determined, the length remains constant, there being no appreciable stretch; but so that metal does not run to metal, and to take up any possible slip, a friction coating consisting of a layer of canvas, to which is glued fine sheets of cork, covers the rims of the pulleys. Thus, the slip is very low, and consequently a very high transmission efficiency can be guaranteed.

Under several conditions, the system is unsuitable, but for continuous drives above 10 h.p., no matter how close or distant the centres, whether horizontal, vertical, or tangential drives, the system has many advantages.

Machinery Display at the Canadian National Exhibition

Staff Article

The variety, quantity and quality of the machinery exhibit at the Canadian National Exhibition, in Toronto, for this year, 1913, the enthusiasm displayed by those represented by, and in charge of, the different lines shown, and the evidently increasing interest taken by the public in this important feature of our National development and achievement, go to show that those responsible for the direction of the undertaking as a whole would be consulting the popular demand and manufacturers' desire, were immediate steps taken to provide accommodation commensurate with the place and part which machinery occupies and plays in our country's upbuilding.

The Lumen Bearing Co., Toronto had a large number of die-castings on view.

The Wells Pattern & Machine Works, Toronto, showed a full line of foundry chaplets.

The Jones & Moore Electric Co., Toronto, showed a number of "Century" electric motors.

The Augustine Automatic Rotary Engine Co., Toronto, exhibited several of their rotary type engines.

The Brownwall Engine and Pulley Co., Lansing, Mich., showed several gasoline engines in operation.

MacDonald & Sons, Ltd., Toronto, showed steamfitters' supplies, such as pipe threaders and wrenches.

The Ontario Wind Engine and Pump Co., Toronto, showed a number of "Chapman" gasoline engines.

L'Air Liquide Society, Montreal, were demonstrating their oxy acetylene process for welding and cutting metals.

The "Honest Injun" Motor Co., Toronto, were represented by a number of their "Honest Injun" gasoline engines.

The George B. Meadows Co., Toronto, were located in the Industrial Building, and exhibited their "sure grip" metal lockers.

The Dennis Wire and Iron Works, Ltd., London, located in the Process Building, had on show examples of their metal lockers.

The Cling-Surface Co., Buffalo, were distributing literature and demonstrating the merits of their well known belt dressing.

The Can. Fairbanks-Morse Co., Toronto, had an exhibit in the Agricultural Section, consisting of gasoline engines, scales, etc.

The Positive Clutch and Pulley Co., Toronto, showed a number of their wood rimmed pulleys with pressed steel spokes malleable iron hubs.

The Massey Harris Co., Ltd., Toronto, showed a number of oil engines, driving pumps and demonstrated a power spraying apparatus for farm work.

The Dominion Belting Co., Ltd., Hamilton, had on hand supplies of their well known "Maple Leaf" brand of cotton duck belting and dressing.

Julius & August Erbsloh, Barmen, Germany, represented by the Canadian Aluminum Products Co., had a full line of aluminum products on view.

The British Aluminum Co., Ltd., Toronto, had a varied and interesting exhibit showing the many purposes for which aluminum can be employed.

D. K. McLaren Co., Toronto, exhibited a complete line of their well known "British" oak tanned leather belting, also steel split pulleys and mill supplies.

The Schaeffer & Budenburg Mfg. Co., Brooklyn, N.Y., were represented by a complete line of their well known pressure gauges and the "Resisto" gauge glass.

Jones & Glassco, Montreal, demonstrated the Renold silent chain drive. They had also a show case containing various sizes and sections of Renold chains.

The William Hamilton Co., Ltd., Peterborough, Ont., exhibited a "Samson" water wheel, a centrifugal type "stuff" pump for pulp mills, and some saw mill machinery.

The J. L. Morrison Co., Toronto, representing the Advance Machinery Co., were exhibiting several paper cutting machines for bookbinders, paper makers, printers, etc.

The Dearborn Drug & Chemical Co. of Canada, Ltd., Toronto, through their representative and printed matter, explained the merits of the Dearborn treatment of boiler feed water.

The Garlock Packing Co., Hamilton, had on hand a full line of their well known packings and greases. They were also showing Lunkenheimer valves and other of this company's specialties.

The Canadian Pneumatic Tool Co., Ltd., Montreal, showed an extensive line of "Duntley" electric tools, compressed air riveters, drills, etc. The "Fyle" steam-driven electric headlight for locomotives was also exhibited. The Holden Co., Ltd, Montreal, are the sales agents.

The Agnew Electric Welder Co., Ltd., Walkerville, Ont., exhibited an electric spot and butt welder, the former being in operation and welding Chapman ball bearing carriages as a demonstration.

Cowan & Co., Galt, Ont., showed a number of woodworking machines, such as a chain saw mortice, 12 in. moulder, 12 in. power feed rip saw, cross cut and mitre saw, and a vertical hollow chisel mortice machine.

The Fisher Motor Co., Ltd., Walkerville, Ont., were exhibiting the "Vollans" spot and butt electric welding machines, and showed the various classes of work that these machines are capable of handling.

The Borden-Canadian Co., Toronto, had a full line of their "Beaver" and "Premier" die stocks and pipe cutters. The latter are of new design, made in two sizes, and embody several new and distinctive features.

Canadian Quality Saw & Tool Works, Montreal, had a Robertson power hack saw machine for demonstrating in connection with their "Quality" hack saw blades. They also showed the "Jennings" expansive bit.

William C. Wilson & Co., Toronto, exhibited a full line of packings and mechanical rubber goods, the product of the Home Rubber Co., Trenton, N.S. The O.I.M. and N.B.O. packings were two of the principal features.

The Preston Woodworking Machinery Co., Ltd., Preston, Ont., exhibited for the first time and had a number of machines on view including a 36 in. band saw, 24 in. pony planer, 12 in. jointer and a variable feed saw.

The Canada Machinery Corporation, Galt, Ont., staged an interesting exhibit of metal and wood-working tools, the principal being a 20 in. engine lathe, 24 in. crank shaper, 12 in. four side moulds, 12 in. inside moulder, tenoning machine with cut-off saw, chain mortice and sash trimmer.

The Linde Canadian Refrigeration Co., Ltd., Montreal, P.Q., had an interesting exhibit in the Government Building, where they have a plant working in connection with the refrigeration system installed there for the protection of perishable goods.

R. A. Lister & Co., Toronto, had several oil engines in operation, the principal of these being the Lister-Bruston 40-light automatic electric lighting set, which is so constructed that the engine will begin to operate by simply turning on the lighting switch.

The Twin City Oil Co., Berlin, Ont., showed two novelties—one being the "Manzel" tire pump and the other the "Taber" boiler compound feeder. The former is attached to an automobile engine and the latter is an automatic device attached to the feed pump.

The Canadian Fairbanks-Morse Co., Toronto, exhibited their well-known line of transmission machinery including "Skefko" ball bearings, pulleys, hangers, grip nuts, belting ,etc. They had a shaft running in "Skefko" ball bearings to demonstrate the frictionless features of the latter.

The Canadian Morehead Mfg. Co., Woodstock, Ont., exhibited their well-known steam traps. A condenser trap with boiler feed, a non-return trap and a No. 6 return trap, were on view. This firm also handle the "Otis" feed water heater. G. W. Cole and E. I. Bickle were in charge of this exhibit.

The Dodge Mfg. Co., Toronto, had as usual an interesting exhibit of their well known line of power transmission machinery, including steel and split wood pulleys, bearings, hangers, etc. A wood pulley was to be seen showing clearly the method of manufacture. Mr. John F. Haas had charge of this exhibit.

The General Machinery Co., Toronto, exhibited the "Munciel" crude oil engine and Luitwieler pumps. The engine is of the semi-Diesel horizontal type, was operating a triplex pump. A vertical motor driven Luitwieler pump was also shown in operation, together with two other pumps operating a pressure tank system.

S. F. Bowser & Co., Inc., Toronto, had an exhibition in the Transportation Building and also in the Industrial Building. They were demonstrating the merits of the "Bowser" system for storing and distributing lubricating oils, gasoline, etc. Equipment noted included self-measuring hand and power driven pumps, tanks, oil filters, etc.

The Canada Metal Co., Ltd., Toronto, had an excellent display of their well known products, such as lead pipe, plumbers' supplies, copper ingots, zinc., spelter, as also samples of various brands of babbitt metals, including the Harris heavy pressure babbitt. One feature of this exhibit was an illuminated sign showing a man pouring metal.

W. A. Martin & Co., Toronto, showed an interesting line of engineering and mill supplies. The principal features were the "Gripoly" woven hair belting, "Neptune" and "Spartan" leather beltings, Darwin & Milner's high-speed steels. This firm represents the Canadian British Engineering Co. They also showed the "Callender" babbitt, phosphor bronze, etc.

H. L. Pieler Co., Toronto and Montreal, had a full line of Ashton valves, Mason regulators, and Bundy steam traps on view. Sharing the same stand were **The Engineering Specialties Co., Toronto,** who were showing their quick action blow-off valves, "Flexible" tube cleaners and Jefferson unions. A new appliance is the "Hardt" generator for hot water systems.

Keith's, Ltd., Toronto, had, in the Machinery Hall, an interesting exhibit, consisting of a refrigerating plant, complete with ammonia compressor, condenser and piping, etc. The compressor is a "Frick" machine of 6 tons capacity, of the vertical two-cylinder type, and was operated by a 10 h.p. C.G.E. motor. They also had an exhibit of electric fixtures in the Process Building.

The Boiler Repair and Grate Bar Co., Toronto, showed the 20th century shaking and dumping grate bar. Their booth was shared by **The Perolin Co., of Canada, Ltd.,** who handle "Perolin" for boilers. This is a comparatively new material on this market, and, while not, strictly speaking, a boiler compound, is used for preventing the formation of scale in boilers. Several exhibits are shown indicating its preservative effect on metal. Mr. S. De Milt was in charge of this stand.

The James Morrison Brass Mfg. Co., Toronto, were located in the Industrial Building, and had a full display of the various lines which they manufacture. Their products exhibited included steam and hydraulic pressure gauges, injectors, stop valves, engine counters, safety valves, engine-room telegraphs, etc.

The Northern Electric Mfg. Co., Montreal, had an attractive display in the Industrial Hall, exhibiting their telephones, fire alarm and electrical apparatus.

W. D. Beath & Son, Ltd., Toronto, gave demonstrations of their overhead industrial tracks and runways, one exhibit being an overhead track with a 3-way switch and cross over, both operated from the ground by chains; stops being fitted to prevent the trolley running into an open switch. A special type of trolley is used with this equipment. An overhead foundry track with a fixed switch was shown, the direction of the trolley being controlled by a stop placed in front which engages with the switch and is operated from the ground.

The A. R. Williams Machinery Co., Toronto, occupied their old stand at the western entrance of the Machinery Hall, and had on show a number of machine tools, including an "American" 16 in. high duty lathe, a "Barkey" No. 4 grinder, "Hanfield" presses, a Hendey Machine Co.'s No. 2 universal milling machine, a Smith & Mills 12 in. shaper, Herbert Morris Co. chain blocks, and a case of taps and dies by the Canadian Tap and Die Co., Galt, Ont. They were also demonstrating a Warner & Swasey universal hollow hexagon turret lathe. In another section they had an exhibit of motor boat engines.

The Chapman Ball Bearing Co., of Canada, Toronto, occupied considerable space in the centre of the Machinery Hall. Several interesting exhibits were to be seen, among these being a testing plant for demonstrating the saving in power that can be effected by using ball bearings as against the ordinary type. Pressure put on a shaft running in a set of ordinary bearings, by a hydraulic jack and readings taken from an ammeter show the amount of power absorbed. The same test is made with "Chapman" ball bearings. The comparative results record the difference in power necessary to drive the respective shafts.

C. P. R. INSPECTION TOUR.

SIR THOMAS SHAUGHNESSY, president of the C.P.R., left Montreal with a party at 5.35 Wednesday afternoon, September 3, on the annual tour of inspection of the system preparatory to the annual meeting of the Company, to be held October 1. The party will be away three weeks, and will go straight to the coast. With Sir Thomas were Messrs. R. B. Angus and H. S. Holt, Montreal, Sir Edmund Osler and Mr. W. D. Matthews, Toronto, while Sir William Whyte will join the party at Winnipeg.

From Vancouver and Victoria a trip will be taken on the new steamer, Empress of Asia. The party is going by way of Minneapolis, Moose Jaw and Calgary. Some important announcements may be expected to follow the return of the party.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

	Mont'l.	Tor'to.
Grey Forge, Pittsburg.	.....	14 25
Lake Superior, charcoal, Chicago	.....	14 50
Middlesboro, No. 3....	20 00	21 50
Carron, special	22 50	.....
Carron, soft	22 50	.....
Cleveland, No. 3......	20 00	22 00
Clarence, No. 3	20 00	21 00
Jarrow	.....	23 50
Glengarnock	.....	26 00
Michigan charcoal iron	27 00	.....
Ferro Nickel pig iron (Soo)	.....	25 00
Staveley, No. 1	20 00	22 50
„ No. 3	20 00	22 00

BILLETS.

	Per Gross Ton.
Bessemer billets, Pittsburgh ...	$27 00
Open hearth billets, Pittsburgh.	27 00
Forging billets, Pittsburgh	34 00
Wire rods, Pittsburgh	28 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto..	2.10
Steel bars, f.o.b., Toronto........	2.15
Common bar iron, f.o.b., Montreal.	2.15
Steel bars, f.o.b., Montreal.......	2.25
Bessemer rails, heavy, at mill....	1.25
Steel bars, Pittsburgh, future	1.40
Tank plates, Pittsburgh, future...	1.45
Beams, Pittsburgh, future	1.45
Angles, Pittsburgh, future	1.45
Steel hoops, Pittsburgh	1.50

F.O.B., Toronto Warehouse.	Cents.
Steel bars	2.30
Small shapes	2.40

Warehouse, Freight and Duty to Pay.

	Cents.
Steel bars	1.85
Structural shapes	1.95
Plates	1.95

Freight, Pittsburgh to Toronto.

18 cents carload; 21 cents less carload.

IRON PIPE FITTINGS.

Canadian malleable, 40 per cent.; cast iron, 65; standard bushings, 70; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 75; malleable, lipped unions, 65.

BOILER PLATES.

	Mont'l.	Tor'to.
Plates, ¼ to ½ in., 100 lbs.	$2.35	$2.30
Heads, per 100 lbs.........	2.65	2.65
Tank plates, 3-16 in.......	2.60	2.55
Tubes, per 100 ft., 1 inch	9.50	8.50
" " 1¼ in.	9.50	8.50
" " 1½ "	9.50	9.00
" " 1¾ "	9.50	9.00
" " 2 "	8.75	8.75
" " 2½ "	11.15	11.50
" " 3 "	12.10	12.00
" " 3½ "	14.15	14.50
" " 4 "	18.00	18.00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Stove bolts	80 & 7½
Machine bolts, ⅜ and less	65 & 5
Machine bolts, 7-16.......	57½
Blank bolts	57½
Bolt ends	57½
Machine screws, iron, brass	35 p c.
Nuts, square, all sizes.....	4c per lb off
Nuts, Hexagon, all sizes..	4¼ per lb off
Fillister head	25 per cent.
Iron rivets	60, 10 p c off
Wood screws, flathead, bright	85, 10, 7½ p c off
Wood screws, flathead, brass	75, 10, 7½ p c off
Wood screws, flathead bronze	70, 10, 7½ p c off

National-Acme "Milled Products."

Sq. & Hex Head Cap Screws	65 & 10%
Sq. & Hex Head Cay Screws	65 & 10%
Rd. & Fil. Head Cap Screws	45-10-10%
Flat & But. Head Cap Screws	40-10-10%
Finished Nuts up to 1 in. ..	75%
Finished Nuts over 1 in. ..	72%
Semi-Fin. Nuts, up to 1 in...	75%
Semi-Fin. Nuts over 1 in.....	72%
Studs....	65%

Discounts f.o.b., Montreal.

FINE STEEL WIRE.

Discount 25 per cent. List of extras. In 100-lb. lots: No. 17, $5; No. 18, $5.50; No. 19, $6; No. 20, $6.65; No. 21. $7; No. 22. $7.30; No. 23, $7.65; No. 24. $8; No. 25, $9; No. 26, $9.50; No. 27, $10; No. 28, $11; No. 29, $12; No. 30, $13; No. 31, $14; No. 32, $15; No. 33, $16; No. 34, $17. Extras net. Tinned wire, Nos. 17-25, $2; Nos. 26-31, $4; Nos. 30-34, $6. Coppered, 75c; oiling, 10c.

WROUGHT IRON PIPE.

The following are Toronto jobbers' discounts on pipe in effect from April 21, 1913:

Standard	Buttweld Black	Gal.	Lapweld Black	Gal.
¼ ⅜ in.	62	47	....	....
½ in.	68	58	....	....
¾ to 1½	71½	61½	68½	58½
2 in.	71½	61½	68½	58½
2½ to 4 in. ..	71½	61½	70½	60½
4½ to 6 in. ..	....	....	71½	61½
7, 8, 10 in. ..	....	....	66	54
X Strong P. E.				
¼, ⅜, ½in. ..	56½	46½	....	....
¾ to 1½ in. ..	67½	57½	....	....
2 to 3 in.	68½	58½	....	....
2½ to 4 in. ..	....	....	65	55
4½ to 6 in. ..	....	....	64	56
7 to 8 in.	....	....	55	45
XX Strong P. E.				
½ to 2 in.	43	33	....	....
2½ to 4 in. ..	....	....	43	33

PRICES OF WROUGHT IRON PIPE.

Standard. Nom. Diam.	Price. per ft.	Extra Strong. Sizes Ins.	Price per ft.	D. Ex. Strong. Size Ins.	Price per ft.
⅛in	$ .05½	⅛in	$ .12	½	$ .32
¼in	.06	¼in	.07½	¾	.35
⅜in	.06	⅜in	.07½	1	.37
½in	.08½	½in	.11	1¼	.52½
¾in	.11½	¾in	.15	1½	.65
1 in	.17½	1 in	.22	2	.91
1¼in	.23½	1¼in	.30	2½	1.37
1½in	.27½	1½in	.36½	3	1.86
2 in	.37	2 in	.50½	3½	2.30
2½in	.58½	2½in	.77	4	2.76
3 in	.76½	3 in	1.03	4½	3.26
3½in	.92	3½in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4½in	1.27	4½in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.80	...	.....
7 in	2.38	7 in	3.81	...	.....
8 in	2.50	8 in	4.34	...	.....
8 in	2.88	9 in	4.90	...	.....
9 in	3.45	10 in	5.48	...	.....
10 in	3.20	....	....	...	.....
10 in	3.50	....	....	...	.....
10 in	4.12	....	....	...	.....

NAILS AND SPIKES.

Standard steel wire nails, base ..	$2 40	
Cut nails	$2 60	2 65
Miscellaneous wire nails..	75 per cent.	
Pressed-spikes, ⅝ diam., 100 lbs. .	2 85	

OLD MATERIAL.

Dealers' Buying Prices.	Mont'l.	Tor'to.
Copper, light	$10 50	$11 50
Copper, crucible	12 50	14 50
Copper, uncr'bled, heavy	12 00	12 50
Copper wire, uncrc'bled	12 00	12 50
No. 1 machine compos'n	10 50	11 50
No. 1 comps'n turnings	9 50	9 50
No. 1 wrought iron	10 00	8 00
Heavy melting steel	8 00	10.00
No. 1 machinery cast iron	13 00	14 00
New brass clippings	8 50	9 00
No. 1 brass turnings	7 25	8 00
Heavy lead	3 50	4 00
Teal lead	2 75	3 00
Scrap zinc	3 00	3 50

COKE AND COAL.

Solvay Foundry Coke	5.95
Connellsville Foundry Coke	5.45
Yough, Steam Lump Coal	3.93
Penn. Steam Lump Coal	3.63
Best Slack	2.95

All net ton f.o.b. Toronto.

METALS.

	Mont'l.	Tor'to.
Lake copper	$17.00	$16.25
Electrolytic copper	16.75	16.25
Casting copper	16.50	.....
Spelter	5.25	5.75
Lead	5.40	5.00
Tin	44.50	42.00
Antimony	9.00	9.00
Aluminum	22.00	18.00

MISCELLANEOUS.

	Cents
Putty, 100 lb drums	$2.70
Red dry lead, 5 cwt. casks, per cwt.	6.00
Glue, French medal, per lb	0.10
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.26
Benzine, per gal.	23½
Pure turpentine	0.60
Linseed oil, raw	0.60
Linseed oil, boiled	0.63
Plaster of Paris, per bbl.	2.10
Plumbers' Oakum, per 100 lbs.	3.25
Pure Manila rope	17

SMOOTH STEEL WIRE.

No. 6-9 gauge, $2.25 base; No. 10 gauge, 6c extra; No. 11 gauge, 12 extra; No. 12 gauge, 20c extra; No. 13 gauge, 30c extra; No. 14 gauge, 40c extra; No. 15 gauge, 55c extra; No. 16 gauge, 70c extra. Add 60c for coppering and $2 for tinning.

Extra net per 100 lb.—Spring wire; bright soft drawn, 15c; charcoal (extra quality), $1.25.

SHEETS.

	Mont'l.	Tor'to.
Sheets, black, No. 28	$2 75	$2 90
Canada plates, ordinary, 52 sheets	2 90	3 00
Canada plates, all bright.	4 00	4 15
Apollo brand, 10¾ oz. (American)	4 30	4 20
Queen's Head, 28 B.W.G.	4 40	4 40
Fleur-de-Lis, 28 B.W.G.	4 20	4 25
Gorbal's Best Best, No. 28	4 40	4 40
Viking metal, No. 28	4 40	4 40

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents.

Montreal, September 8, 1913.—There has been little change in business conditions during the past week. A fairly steady volume of trade is being done, and one hears few complaints except with regard to collections, which are still difficult to make. There is not much doing in the heavy machinery trade, and brokers do not look for any marked improvement before the end of the year. Tenders have been submitted on the equipment for the machine shop of the Atlantic Sugar Refineries' new plant at St. John, N.B.; but an early allotment of the order is not probable, and there seems to be a general feeling that the amount of equipment eventually purchased will be a great deal less than that on which tenders were invited.

Pig Iron, Copper, etc.

There is nothing yet to record concerning the reorganization of the Canada Iron Corporation beyond the fact that Mr. Francis F. Whyte has relinquished the receivership, and has returned to New York. The Montreal Trust Company has been appointed receiver in his place.

The present low price of English pig is resulting in a steadily increasing placing of orders by consumers. The orders rule on the small side, but dealers are at present in a very optimistic frame of mind with regard to the future.

Copper is very firm, with a strong demand from all quarters. Standard copper reached £75 in London to-day, that being the highest price attained for a very long time. Labor troubles in the Lake Superior district seem to have quieted down, and a good supply of ore is now coming forward.

Toronto, Ont., Sept. 9, 1913.—Dealers in machine tools noticed a distinct improvement in business this week. This was not due to the Exhibition, however. Whatever the reason, all the dealers spoken to were jubilant over last week's sales and future prospects.

Pig Iron, etc.

Two more blast furnaces have closed down in Ontario during the last week, but it is explained that this is due to accidents, and not to failure to compete with American concerns. Prices for pig iron are firm. The Steel Co. of Canada's price for foundry pig iron is $18.50 per gross ton. Steel bars are firm. Implement concerns are withholding their orders, although the International Harvester Co. of Hamilton, Ont., who reopened their plant this week, following a month's holiday, have placed orders for a big supply of bars. Reinforcing steel is in great demand. Steel wire is firm, and copper wire went up ½ cent yesterday. The price of sheets just now is described as a "good buy." Business in steel generally is only about half what it was a year ago, which was a record year.

Metals.

Manufacturers may expect a rise in New York copper, and a fall in all kinds of lead owing to the strike in American mines. and a better situation in Mexico, which will increase the output. Tin rose a cent per lb. last week, but little metal is being sold. The copper market in England is firm, but in New York things are quiet. It is a peculiar situation. Toronto dealers are buying largely of old material, due to a general loosening up, caused by better prices prevailing now than two weeks ago.

STRATFORD'S G.T.R. BOYS MADE CLEAN SWEEP.

THE city of Stratford made a clean sweep in the prizes for mechanical drawings at the C. N. Exhibition. The winners are all apprentices in the Grand Trunk shops at Stratford. There were twenty-five drawings in the competition, many of which were from Montreal. The following are the results:—

Drawings of steam driven machinery, 1st prize, $20—J. F. Tonye.

Drawings of electrical equipment, 1st prize, $10—L. Bexon.

Drawings of hydraulic or pneumatic machinery, 1st prize, $10—L. Ireland.

The city's showing reflects great credit on Master Mechanic Robt. Patterson.

Nearly 1,000 girls are being taught to operate electrically driven machinery in a New York trade school.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Engineering

Brantford, Ont.—Plans have been prepared for an addition to the plant of the Hartley Foundry Co. on Canal Rd.

Brantford, Ont.—John Hall & Sons are about to add another addition to their plant for the manufacture of special machinery.

Montreal, Que.—The Canadian Tube & Wire Co., Ltd., Victoria St., will have plans prepared at once for the erection of a wire and rolling mill.

Guelph, Ont.—The Nokros Union Co. will manufacture their products in Guelph, Ont., and expect to be ready for business about November 1.

Hamilton, Ont.—It is reported that a Michigan iron concern, known as the Manistee Iron Company, may locate a Canadian branch in this city.

Montreal, Que.—The Imperial Wire & Cable Co., Montreal, has secured a permit for the erection of an eight-storey factory and office building. The cost is estimated at $1,500,000.

Welland, Ont.—The Dain Manufacturing Co., have decided to manufacture drills in addition to their other products. The plant will not be enlarged, but more hands will be taken on.

C.P.R. Shops.—President Sir Thomas Shaughnessy of the C.P.R., announced that large additions will be made to their shops in Montreal, and that $100,000 will be spent on new car shops at McAdam Junction, N.B.

Montreal, Que.—Large extensions are to be made on the C.P.R. Angus shops, which are to include the erection of two material shops, passenger car shops, freight car shops, bolt and nut shop, and extension to locomotive shops.

Berlin, Ont.—President Wendt, of the Buffalo Forge Co., Buffalo, N.Y., has completed negotiations for the establishment of the company's Canadian branch in Berlin. Five acres of Woodside Park property have been deeded to the company on which a foundry will be erected this fall.

St. Catharines, Ont.—The J. H. Williams Co., of Brooklyn, N.Y., manufacturers of lathe dogs, are reported to have purchased a building site for their plant, and will proceed with construction work in the course of a month or so. John Cotter will be the manager of the Canadian plant.

Toronto, Ont.—Hepburn & Fisher, Ltd., have been incorporated to manufacture structural steel at Toronto, with $150,000 capital. No plans have been made yet for a new plant, but this will be built in the near future. This particular section of the business has developed, together with that of John T. Hepburn, crane maker, having been started in June, 1912. The steel manufactured is principally for builders.

Sarnia, Ont.—The Cleveland Foundry Co., Cleveland, Ohio, have decided on Sarnia as the place at which they will erect their plant for the manufacture of oil cooking stoves, oil heating stoves, and cooking utensils. Options have been secured on sites in Point Edward and Sarnia. The company will invest over $200,000, and will employ 150 men at the start. The company is, it is understood, being financed by the Imperial Oil Co. F. E. Drury is president, and F. W. Ramsey manager.

Toronto, Ont. — The Moffat-Irving Steel Works, Ltd., who have been experimenting in the production of steel castings by means of an electric furnace for some months, have now reached a stage where they are open to receive orders for castings on a large scale. They have applied to the Toronto Harbor Commission for a site on which to build a large plant next year. The firm was recently incorporated in Ontario, with $100,000 capital. The principal shareholders are, J. W. Moffat, T. C. Irving, and Thos. R. Loudon, all of Toronto.

Toronto, Ont.—The John Inglis Co., Limited, engine and boilermakers, have prepared plans for the erection of a new plant on the old prison property, which is adjacent to a section of their present plant. The latter will be converted into a foundry, capable of making the largest castings. The new plant will measure 120 x 600 feet, and will comprise all departments to be found in an up-to-date general engineering works. The order for the steel has been given to a Montreal firm. Mr. Reaves is secretary-treasurer, and Wm. Inglis managing director.

Walkerville, Ont.—Berry Bros., varnish manufacturers, have partially completed an addition to their Walkerville plant. The total cost will be in the neighborhood of $15,000. The contract for the work was awarded to Wells & Gray, engineers, Toronto. The firm is a branch of Berry Bros., Detroit, Mich. The Walkerville plant was established some few years ago to handle the Canadian trade, and the rapid development has necessitated the enlargement that is now under way. The Seagrave Co., another Walkerville firm is preparing plans for another factory building. This firm is a branch of the Seagrave Co., Columbus, Ohio, and manufactures fire apparatus. The Walkerville firm has recently sold a fire steamer, auto-propelled, to the city of Windsor, at a cost of about $10,000.

Electrical

Carman, Man.—The Canada Tile and Fireproofing Co. will apply for a franchise to supply the town with electric light.

Elk Lake, Ont. — The Miller Lake-O'Brien Mine is developing the water power near Gowganda, on the east branch of the Montreal River, and will use the power electrically at the mine at Miller Lake.

Ancaster, Ont.—The village sent a deputation to Toronto last week to meet Hon. Adam Beck, and secure information regarding Hydro-Electric power. Arrangements may be made with Dundas to provide power.

Salmon, B.C.—A. H. Nairn, representing the contractor's setting up department and E. Hallgren, an expert from the builder's factory in Sweden, arrived here last week to set up the 200 h.p. Diesel oil engine, which will furnish the power for the city's electric light.

Toronto, Ont.—The Rice Hydra, Ltd., electrical contractors, 152 Bay street, have made an assignment to W. L. Martin A meeting of creditors will be held this week. The concern was a fairly large one, and had done some important work. The company will be reorganized under a new name.

Toronto, Ont.—To accommodate the many users of Hydro-Electric energy throughout the city, the Hydro Commission has found it necessary to build an addition to the transformer station on Strachan Avenue. The City Architect has issued the permit calling for the construction of a two-storey brick, steel and concrete building, costing $35,000.

Kingston, Ont.—The Department of Marine and Fisheries will erect a wireless telegraph station 300 feet northwest of Fort Henry for the purpose of forming a connecting link between Montreal on the east and Toronto on the west in a chain of stations reaching across Canada from Labrador to Vancouver. A site has been secured, and the work will be commenced shortly.

London, Ont.—The hydro-electric department will show a surplus of $40,000 by the end of November, the close of the fiscal year. For the first half, it was $20,000, and the last part of the year has seen a great increase of business. The consumers now number nearly six thousand, and the amount of power sold is nearly 6,000 horse-power. As a result of this surplus, power rates will be reduced next year. It is the intention of the commissioners to supply energy at a price as near cost as it can be furnished.

Municipal

Vegreville, Sask. — When the town has sold $56,000 worth of debentures, it will proceed to drill more gas wells.

Walkerville, Ont.—The burgesses voted on Sept. 6 on a by-law to raise $16,234 for cost of an incinerator plant.

Hamilton, Ont.—The city may purchase the gravel pit owned by Mr. McConnell, Waterloo Rd., Guelph, and instal a stone crusher.

Innisfail, Alta.—The by-law to raise by way of debentures $6,000 for the purpose of establishing an electric light plant has been voted on.

Bracebridge, Ont.—By-laws to raise $2,000 to provide for the purchase of site and right of way for a proposed rock crushing plant, and $10,000 to pay off floating debt of town were both passed recently.

General Industrial

Toronto, Ont.—Fire did $15,000 worth of damage at the Toronto Pottery Co.'s plant on Friday last.

Calgary, Alta.—The Keystone Portland Cement Co. propose to erect a plant at Blairmore, Alberta, to manufacture lime, brick and cement.

London, Ont.—The Rexall Drug Co., of Canada, will erect a $125,000 plant here or in Toronto. W. T. Strong, of this city, is vice-president of the company.

Essex, Ont.—The Windsor Pearl Button Co. will instal a branch plant here, with machinery, costing $7,000. It gets a free site, a $2,500 bonus, and exemption with free water.

Kincardine, Ont.—Fire on September 5 destroyed the three-storey grist mill belonging to J. W. Rea. The loss is between twelve and fifteen thousand dollars; insurance, $6,500.

Petrolia, Ont. — The Canadian Oil Companies, Ltd., are contemplating an enlargement of their plant which will double the output. New equipment is being bought for the wax works.

Toronto, Ont.—B. Oldstein has bought considerable property on St. Patrick Street, on which he will erect a factory. The property includes numbers 165-7-9 and 171, and was owned by J. W. Barry. The price paid was $18,000.

Nelson, B.C.—Authorization was given by the city council on August 26 to a committee, headed by Mayor Keefe, to make a definite proposition to the Nelson Gas and Coke Co. for the purchase of that corporation's plant here.

Sherbrooke, Que.—The agreement between this city and the Panther Rubber Co., has been signed. The company gets exemption from taxes for a period of years. The company agrees to spend $25,000 in wages during the first year, and increases this amount as time goes on.

Calgary, Alta.—A syndicate of local and Minneapolis capitalists will shortly commence the erection of what it is claimed will be the largest flour mill in the British Empire. It will be built in four units, to cost $1,400,000 each, and, when all the units are completed, will have a capacity of 6,000 barrels of flour per day. Work on the first unit will be commenced immediately.

Cobalt, Ont.—By the installation of a large tube mill and other changes at the O'Brien concentrator, the capacity of that mill will be increased from 100 tons to 150 tons. The changes are now being made, and it is expected that 150 tons will be treated in the mill before the end of October. No change is being made in the cyanide process, which has been in use for several years at the mill.

St. Catharines, Ont. — The Rice-Hulbert Shoe Co., of Courtland, N.Y., has decided to establish a Canadian branch of its concern in St. Catharines. A site has been purchased on the Western Hill near the Grand Trunk Railway, and tenders are being called for a two-storey brick building, which will be followed by another after the first is completed. The company expects to be employing 150 hands early in the winter.

Sault Ste. Marie, Ont.—The commercial portion of the city's water front is to be extended by the addition of a large dock and warehouse for the Standard Oil Co., the contract for which has been let. The dock will cost $50,000, and the warehouse and equipment will involve a further expenditure of over $75,000. Provision will be made for docking the largest of the vessels of the Standard Oil Co.'s fleet, which convey the oil in bulk to Sault Ste. Marie.

Refrigeration

Ottawa, Ont.—The city is contemplating the erection of a civic abattoir.

Toronto, Ont.—The American Club is having a 1-ton "York" refrigerating plant installed.

Engleton, Ont.—Joseph Kilgour's residence is being equipped with a 3-ton refrigerating plant, furnished by the Frick Co., Waynesboro, Pa.

Toronto, Ont.—St. Augustine Seminary is being equipped with a 6-ton refrigerating machine, furnished by the York Manufacturing Co., York, Pa.

Niagara Falls, Ont.—Frank Douglas and Henry Campagne are considering the establishment of a cold storage plant here. The estimated cost is $50,000.

Prince Albert, Sask.—The Saskatchewan Abattoirs, Ltd., is preparing to erect a cold storage and packing plant. James O'Callaghan is the managing director.

Vonda, Sask.—The Canadian Government has awarded the contract for construction of a warehouse with cold storage facilities at Vonda, designed especially for storage of meats.

Niagara Falls, Ont.—The Douglas Pure Ice Co. is erecting a new structure, to be equipped with machinery for the manufacture of ice. A 75-ton or 100-ton plant, it is stated, will be installed.

Berlin, Ont.—M. B.Rickert has purchased one 2-ton vertical single-acting belt-driven enclosed type refrigerating machine and high pressure side, complete, from the York Mfg. Co., York, Pa.

Toronto, Ont.—C. White & Co. are installing an 8-ton vertical single acting belt-driven enclosed type refrigerating machine and high pressure side complete, supplied by the York Mfg. Co., York, Pa.

Vancouver, B.C.—The Mainland Ice & Cold Storage Co., who are building a new cold storage house, have let the contract for installation of direct expansion piping for same to the Frick Co., Waynesboro, Pa.

The Question of Uniform Steam Boiler Specifications*

By T. E. Durban**

Needless to say we are in hearty sympathy with the views expressed and the recommendations suggested by the author of this paper, and while the primary application of the subject belongs to United States Boiler Practice, there exists in Canada an equal lack of uniformity in Boiler Regulations, and an equally pressing need of reformation.

THE possibility of uniform specifications for boilers is beset with many difficulties. However, I feel that the chief difficulty has been overcome, and that united action among boiler makers will bring about the much desired uniform specifications. I think that we all have been responsible to some degree for not having a uniform specification, owing to the fact that we have been consumed with petty jealousies, each of the other. Our endeavor to get slight advantages by making changes in specifications, in order to get business, has retarded the progress of such a specification.

While we would all unite in a general way in singing the praises of the uniform specification, we did not exercise any degree of sincerity in our attempt to get to the bottom of the proposition. Now that various States and cities have taken up the matter, and prohibited the common practice of salesmen cutting specifications and making changes in order to get business, it is the belief that we will have closer co-operation among the manufacturers of boilers, to the end that we will all figure on the same thing. Now that we are united, and all see the advantages of the uniform specification, our chief trouble, we believe, is over.

Standard Specification Long Desired.

The standard specification has for many years been the desire of the company that I represent, and we have been working consistently to that end. About 10 years ago we addressed a letter to all boiler makers in the United States, trying to get some concerted action. The replies that we received were most agreeable, but the action was not there. We took the matter up with our Congressmen and Senators, and finally, during the occupancy of that office by Mr. Taft, with the President of the United States, pointing out to him the necessities of a standard specification from the public's viewpoint; citing to him that the United States exercised jurisdiction over boilers on navigable waters in order that it might protect, as far as possible, the lives and property of people who used these waters as a means of transportation, and citing to him that life was not less dear to the man who lived on land and pursued his occupation on the land, than the man who traveled on the water, and pursued his occupation on the water. However, we ran across the unsurmountable barrier of State's rights, when we urged the necessity of a common law governing the building of boilers. In spite of any argument that we could bring about, we landed always in the same place. Our Congressman would have been glad to have introduced a national law, but after consultation with the President, decided with him that it was absolutely useless.

In spite of this, however, a law was passed governing locomotive boilers as used on railroads. This was cited as a reason why there should be a universal law governing all boilers, but as a matter of fact it was also pointed out that a national law was possible in this case because of the fact that these boilers were engaged in Interstate trade. There was a time when locomotives could have been and were halted at the threshold of a State and not allowed to cross the line, due to great variations of laws of construction of boilers.

Existing Conditions a Great Factor.

Now, fortunately, due to various causes, it has become manifest that boilers must be built better and nearer to a common standard than ever before. The large number of laws has made it almost imperative that a man who is engaged in the manufacture of boilers for distribution should throw his whole energy into having the law so constructed that he does not have to carry a stock of material and stock of boilers on hand to meet the requirements of the various laws in the various States, Provinces and cities.

These laws, varying as they do, now from the other, make a needless waste, and as the cry of the country now is for conservation and economy, we think that this argument can be well used with the law makers of all the States and Provinces, who will take the subject up. The waste comes from the fact that a manufacturer is now almost compelled to build each boiler to meet the requirements of each law, necessitating slow progress through the shop, and enormous investment in material. The further fact that different manufacturers put different interpretations on the laws brings about a great conflict in the price of boilers.

With a uniform law and the co-operation of all manufacturers, these differences would be largely overcome, so that the boiler would reach the consumer, not only a better boiler, but for less money. Not only would the manufacturer be able to produce the goods and sell them for less money, and be more certain of his profit, but he would eliminate the probability of a large loss in case his foreman or designing engineer should get confused in the various laws. I think there is no concern manufacturing boilers that has not suffered from the lack of uniformity in provincial or city laws, and of those engaged in making various types of boilers for distribution throughout the entire country, I venture the assertion that there is no one that has not met with very considerable loss. All this can be eliminated; the public can be protected, both as to its life and its investment and the manufacturer can make more money on less investment, if we can succeed in getting concurrent legislation, or approximately concurrent legislation, in various provinces.

Concurrent Legislation Needed.

We are fully alive to the fact that no problem that has ever faced the Canadian or American people has been more discussed than concurrent legislation. The different laws in different provinces tremendously embarrass manufacturers doing interprovincial trade, and they affect our social relations. We know the action that has been put forth to have uniform marriage and divorce laws uniform laws for crime and on credit, and on other matters too numerous to mention, but we believe no subject for concurrent legislation has been broached by people who have been so unitedly combined as to what was required as this problem that we have. There is no doubt in the writer's mind that a conscientious effort on a specification upon which we have all united will influence the law makers in a great number of States who have not yet passed a law, and in turn will influence the laws already on the statute books to such an extent that corrections will be made in them to make them conform to a standard which we can and will ultimately adopt.

It seems to me beyond doubt that a concurrent effort among the manufactur-

*From a paper read before the Boiler Manufacturers' Association Convention in Cleveland, Ohio.

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ers of boilers and mechanical engineers and users of boilers cannot help but bring approximately concurrent legislation. As it is now, the laws are confusing in the extreme, and it requires the undivided attention of a bright mind to so issue the orders to the shop that the boilers will come through without trouble.

Diversity of Boiler Laws.

Boiler laws are coming out from the East, West, North and South—in every direction. Not only are the laws themselves different, but a different interpretation has been put upon the same law by different inspectors and different builders. I presume without exaggeration that there are at least 100 laws and changes to laws in the United States alone, governing the manufacture of our product, and this can be multiplied by a thousand times as many inspectors as there are laws.

Example.

We have asked a decision of one point—the butt strapping of drums. Our interpretation of the law as written in several of the States is that all butt strapped seams be made to a maximum length of 12 ft. We have been informed by some inspectors that this does not apply to water-tube boilers, and by other inspectors that it applies to all boilers. We conformed our specifications to meet the letter of the law; that is, to have no butt strapped seams over 12 ft. long, whereas we have found out since we put this order into effect in our works that many boilers or drums of boilers are being made and passed with butt strapped seams as long as 20 ft.

In spite of all this, we are thoroughly impressed that the boiler inspection laws have been and will be beneficial to all boiler manufacturers and all users, and that out of it will come the ideal boiler in design workmanship and material. This is a consummation to be desired; so that when we come to figure on a job we will be all put on the same basis, and it will be necessary for us to furnish a boiler that, in the estimation of all the law-makers, will be the best boiler made.

Boiler Laws Grouped.

The present laws as enacted have been of great benefit, as they have reduced what was formerly opinion, and frequently guess-work, to something definite and right. As we now have them, they have been classified by our engineers in three groups:

1.—The group comprising Massachusetts, Ohio, Detroit, Manila, Chicago and Indiana. Detroit, Ohio and Manila laws are practically identical. Massachusetts law differs somewhat, and the Chicago and Indiana laws are modifications.

2.—The group comprising all British specifications in which we are interested—British Columbia, Alberta, Saskatchewan and Ontario — which are all copies or modifications of the British Columbia law.

3.—The group comprising inspection laws of Philadelphia, Seattle, St. Louis, Los Angeles, Montana, New York and others. The laws of this group differ from each other, but in a general way are less complicated than those of the other groups.

Boiler Law Vagaries.

All the laws in the United States unite on a factor of safety of five. The Canadian laws require a factor of safety of five and a half to six and a half, and it is optional with the inspector what factor of safety he will accept, depending upon his opinion of the good workmanship that is done and upon just how the boiler happens to strike his fancy. The material for Massachuetts, Ohio, Detroit and Manila is special, both as to the chemical and physical properties. A certified mill test is required for all plate material, and the plates must be stamped in five different places. Other inspections require only a mill test, and are not so particular about the chemical analysis of the material.

We at one time had a boiler refused in Massachusetts, because the chemical analysis of sulphur was off one-thousandth of one per cent. We have coming through our shops, as we presume most of you have, boilers that come under almost all these laws, and the resulting confusicn may be something stupendous, and must be taken care of in the price we make to the consumer on the boilers.

We have now established through the effort of the steel manufacturers, a standard specification on steel, and by common consent we have established the efficiency of certain seams, and also a certain strength that can be allowed per inch of area on braces and stay bolts, so that it does not seem a far cry to get a definite specification on a boiler itself.

Problems to be Solved.

One problem that will confront us will be the variations in tensile strength which is standard with mill. A variation of from 56,000 to 62,000 lb. in tensile strength would make a considerable difference in the thickness of a plate. If one of us should figure on 56,000 and another on 62,000, necessarily one would be figuring on a thicker or thinner plate than the other. In a common specification it would be necessary to specify the material in the braces, and the working stress in pounds. Now it varies from 6,000 to 8,000. Unquestionably, all holes should be drilled from the solid, or punched 1/4 in. small and reamed to size; that is, there should be at least a full quarter inch of reaming.

In Ohio, Detroit and Manila there is a uniformity in the number of braces above the tubes; there are no particular specifications as to tubes of the material in the tubes, but in almost all the specifications the tube holes must be either cut from the solid or punched 1/2 in. small and reamed to size.

The butt strapped seam is now demanded on all boilers, due to the fact that it has been proved to the satisfaction of many people that lap seams are a menace to the life of the boiler, and many boiler explosions have by experts been attributed to lap seams in the longitudinal section. Some laws limit the thickness of plate to 1/2 in. and therefore limit the pressure on horizontal tubular boilers.

We should strive in our uniform specification for a standard specification on material, so as to remove the necessity of carrying material in stock of two different physical and chemical qualities.

If this organization, through its various connections, can establish in each legislative assembly the necessity of uniform treatment of this subject, so that when laws of this kind are coming up they can bring to bear the influence of all interested people, as they easily can, by keeping in touch with the situation of the laws to be enacted, we can accomplish our purpose. Of course, it will be attended with much hard work and honest effort, but, now that we have at least reached an agreement that a standard specification is necessary, the greatest obstacle that has prevented us from having it heretofore, has been removed.

A Uniform Steel Specification.

A uniform steel specification seems to be very easily accomplished. By comparison with three mills, we find that there appears to be no necessity for special requirements such as Massachusetts and Ohio. We find that in the law requiring special steel there is practically no difference between fire box and flange steel on these special requirements, except as to the matter of the brand. Eighty-five per cent. of flange steel coming from one mill has all the qualifications and could be stamped as fire box, and in another mill 93 per cent. of all flange steel could be stamped fire box. That is, both steels have the same chemical and physical qualities and they are changed from flange to fire box, or from fire box to flange, by a stamp which is put on, the only difference being that the mills charge $2 a ton extra for using a stamp marked "Fire Box" as against a stamp that would brand it as "Flange Steel."

"We would suggest that what is really required is more stamps on the plate showing mill test, and less stamps showing the brand. If the mill test stamps are put on so that they can be observed by the inspector, he can then get the full record of the plate from this heat and mill test stamp. He can also tell what the tensile strength is, and not assume it. As a matter of fact, all inspectors and all State laws will assume the minimum tensile strength the law permits, unless they have access to the physical test as made by the mill. There ought to be uniformity regarding this point.

Flange and Firebox Steel.

In these specifications, particularly of Massachusetts and Ohio, fire box steel is specified in the shell and flange steel in the heads. This, in our estimation, is an error. If there is a difference in the steel, and if the fire box steel is supposed to be of a better quality, attributable to its increased ductility, which would make it a better steel for flanging, the law is exactly contrary to the best practice in steel. The best steel should be used for flanging, and therefore the specifications and the law should read, according to our ideas, flange steel in the shell and fire box steel in the heads. As before stated, however, there is no difference in the quality of the steel, hence, we feel that the Massachusetts, Ohio and Detroit inspection laws calling for fire box steel in the shells is clearly in error, militating against people who buy boilers under those laws.

We doubt very much whether any State law would hold good, if it were tested, that specified a certain brand on the plate. We believe that any court would decide that if the plate came up to the physical and chemical test required by the law, it would make no difference what the plate was branded, and it might not be a bad idea for this organization to designate some manufacturer to ship a boiler into one of these States and have it branded "Flange Steel" and make a test case; of course, with the hypothesis that the flange steel passed the physical and chemical tests to entitle it to a brand of "Fire Box."

The boilers that the company I represent manufacture and whose specifications have been submitted, would pass any of the American laws except such laws as call for fire box steel. To a concern building an occasional boiler, and that does not have to carry material and finished boilers in stock, the difference in price of $2 a ton would not be material, but it is important with one that carries a large amount of stock and a large number of finished boilers, and uses from 10,000 to 12,000 tons of steel a year. It can be readily appreciated that it would cost from $20,000 to $24,000 a year to use flange and fire box steel, and it would necessitate carrying, in order to supply the trade promptly, double the amount of stock, both in the flange plate and in the finished boiler; all of which would have to be made up in the price charged to the consumer for the boiler.

Using Flange Steel Throughout.

Along the line of conservation and economy, would it not be wise to adopt flange steel for boilers throughout, for, as previously stated in this paper, there is no difference between flange and fire box steel from the majority of mills except the stamp? It is a direct discrimination against purchasers in various States where they have the law of fire box steel, causing them to pay more money for their boilers. In other words, is it not a fact that the people who reside in States that have not yet passed these laws will get a better boiler, or as good a boiler at least, for the same money, as a resident of a State who buys under the law providing for special steel? The man in the adjoining State would get steel of the same physical requirements and the same chemical analysis and he would get it for less money.

Again, some States require brackets on the boiler, while some States require the boiler to be suspended from a gallows frame. Will a gallows frame support a boiler any better in Indiana than it would in Massachusetts or will a boiler with brackets on stand any better in Massachusetts than it will stand in Indiana? All these things cause extra expense to the manufacturer, and make an extra price to the consumer, for which he gets no adequate return.

Recommendations.

In conclusion, we would recommend:

That boilers be built on a factor of safety of five, of uniform steel, and that this specification cover flange steel.

That the steel be marked with the heat number instead of the brand, and that it be made of minimum tensile strength of 60,000 lb., and be subject to the bending and quenching test, and that it have phosphorus not to exceed 0.03 per cent., sulphur not to exceed 0.04, and manganese 0.50.

That weldless crowfoot type braces be used, of the same quality of steel as the plate, that they be figured on a basis of 7,500 lb. per sq. in. of section in the brace, and that on this basis, no brace be used containing more than 1.28 in. area of section.

That through braces, either above or below the tubes be weldless, and be figured on 7,500 lb. per sq. in. of area.

That all seams be butt strapped with inside and outside covering strips.

That all manholes be 11 x 15 in.

That no plates be used in a tubular boiler thicker than 5/8 in.

That all holes for rivets be punched 1/4 in. small, and reamed to size.

That all flue holes be punched 1/2 in. small and reamed to size.

That no cast iron be used in connection with the boiler, either for reinforcement or any other purpose.

That all plates be beveled on a planer instead of sheared on a bevel shear. A demonstration on a 9-16 in. plate shows that it is impossible to do a good job on a splitting shear, and that the same objection that exists to a punched hole holds good in the use of a splitting shear on thick plate; that is, the metal is distorted by use of a splitting shear.

That water column connections all be 1 1/4 in.

I would recommend, also, that a committee be appointed with power to bring together a committee of boiler makers, steel manufacturers, State and city officials, whether they be inspectors or chairman of the boards; a committee from the American Society of Mechanical Engineers, and a representative from the leading boiler insurance inspection companies; and that the meetings of this committee so appointed shall be open to the general public and that this be done within the next 60 days, in order that rules and regulations may be adopted that can be made uniform for the construction of tubular boilers.

I would also recommend that the utmost publicity be given in all the trade and mechanical papers to the efforts of manufacturers to procure a standard specification.

CONCERNING CREOSOTE.

By W. L. C.

THE last few years have seen a rapid development of the wood preserving industry on the North American continent, largely owing to the increasing scarcity and cost of good tie timber. At the present time there are two standard preservatives in use, zinc chloride and creosote. As zinc chloride is a mineral salt, it is possible to manufacture it to meet specifications. Creosote, however, is a by-product of a by-product, and hence it is very difficult to obtain a desired specified quality. As a result, it has been found necessary to base the specifications on the kind of oil available.

As creosote is used to preserve about 70 per cent. of the lumber treated, and as it appears probable that a shortage will occur in the near future and that high prices will prevail, the problem of increasing the supply is an important one. Creosote is produced in by-product coke ovens, and the threatened shortage should further their increasing adoption as there is enough creosote wasted every year in the beehive coke ovens in Canada and the United States to supply all reasonable demands for years to come.

High Speed Steels and Modern Shop Methods

By J. D. Smith.

The writer of this article points out several features which should be given consideration in the purchase and use of high speed steel in machine shop practice, and draws attention to the fact, too often overlooked, that the old water hardened steels may be successfully employed in many instances and with increased economy comparatively.

ENGINEERS of to-day have come to see the blessings or otherwise of the high-speed steels. Some managers and some workmen, make the mistake of trying to get too much out of the new steels, while others—and these show the best balance sheet at the year's end—are content with fair results.

Machine Effects.

There are many things to be considered when changing from the old water-hardened steels to the new. First, the machine t ols. Where these are of the old type, they must be brought up to the new requirements or the best results cannot be obtained; as they were designed for far less stresses. It was impossible to strain or at least break the machines when using the water-hardened steels, as the tools would invariably give out first; but in my experiments with the new steels, I have frequently strained and sometimes broken machines, lathes especially, without damaging the cutting edge of the tool. Then comes the question of re-designing those parts which have given out under the tests. If lightly made, alterations will not get the results, and it is better to scrap the machines.

Best Results Feature.

Now comes the main question, What are the best results? This means two things, output only, or output with economy. Some men's idea of the use of high-speed steels is to run the tool to destruction at the highest speed the machine will stand, then change the tool for a new one. This may be all right from the point of view of output, but what about the waste of steel with continual re-grinding, grinder's time, wear of machinry, machine-man's time for walking backwards and forwards to the tool stores, machine standing idle? The iutput largely rests with the conditions under which men have to work. Under fair conditions, the output increases, if the conditions are unfair, it drops accordingly.

Sometimes it is decided to get only the best steel on the market. This, in my opinion, is wrong policy, although I am strongly against having too many brands in the shop. After a general survey of the machines, a selection of three or four at the most can be made to cover all the requirements of the shop. Turning locomotive tyres, mill rolls, etc., requires the best possible steel to machine them at the speeds which the machines of to-day are able to stand. Various makers of tool steels make special brands for this particular work, but at a special price, which is the top price. It would not be economical to use this steel to machine ordinary forgings from 20 to 26 tons tensile or Yorkshire iron, neither would it help the output, as steel can be found at much less cost that will machine these softer metals at the highest speeds.

Up to this point we have only considered the ordinary tool which is either ground from the bar or forged to shape at the end, but there are milling cutters, forming tools, etc., which take a far greater expense in their manufacture. Milling cutters, either plain or formed, should always be made of a good brand of high-speed steel, as even if the machine is not capable of a speed or feed approaching the cutting limits of the cutter, the advantage will be gained in the grinding, especially on the machines using gangs of cutters. The only exception is when a very small quantity of articles has to be machined, and the outlay would not be justified. The forming tool for lathe, turret, capstan lathe or automatic machine, comes under the same conditions.

Water-Hardened Steel Not Obsolete.

The water-hardened steel must not be regarded as obsolete, as there are many ways in which it can be used. It is still the best steel for brassfinishers' use, when machining ordinary castings or naval brass bars, as it only requires slacking off by the tool smith after being ground, or in special cases filed to shape. With the highest priced high-speed steel, the output could be no greater, as the ordinary water-hardening steel is capable at the highest speeds possible when machining these metals. It is economical to use high-speed steel when machining the harder mixtures, such as bronze, etc.

Where spring radius or filleting tools are used, it is unnecessary to make these of high-speed steel, as the finishing speeds are so slow that the water-hardened steels are able to stand. The tendency, however, is to do all the finishing in a grinding machine if possible, this method giving greater accuracy for both parallelism and roundness than any lathe, and the time taken being considerably less.

There are many examples on the slotting, shaping and planing machines where it is better to use water-hardened steel, nothwithstanding the using of relieving cutting bars, tool holders, etc., as when machining a surface broken by cored holes, or two or more pieces being piled on top of each other, and there being spaces between. The high-speed steel is more subject to snipping at the cutting edge when jumping over the spaces, although this can be obviated to a certain extent by slacking the tool off in oil, instead of the usual method of cooling in an air blast.

The Lubrication Feature.

Another point which has caused endless controversy is lubrication when using high-speed steels. It is impossible to get the lubricant between the cutting edge and the material, so the next thing tried is flooding the whole tool nose or cutter with lubricant, also the job, making the machine messy, and making it harder for the operator to caliper while the job is running. The lubricant is supplied by a pump, not altogether infallible, and which, therefore invariably breaks down at the most awkward moment. I have experienced all these annoying instances, and have come to the conclusion that it is far better to use the high-speed steels cutting dry, wherever possible to do so. The best results are obtained from lubrication in the cases of drilling and milling machines, as these operations are usually finished surfaces, the lubricant giving a far smoother finish than dry cutting.

There are many makes of high-speed twist drills, round with grooves milled out of the solid, and flat vanadium twisted drills, etc., at varying prices. It is no use to pay the high price for a drill guaranteed to drill at 6 in. or more per minute in depth when the arm of the radial drilling machine is not capable of standing the strain; either pay a less price for drills, and get those which are just above the limits of the machines, or get new machines capable of standing the higher speeds and feeds of the high-priced drills. High-speed steel, like all other inventions, must be used judiciously and within reason. — Machine Tool Engineer.

EXHAUST VENTILATION.

A SHEFFIELD factory inspector reports that, though exhaust ventilation has been provided throughout the grinding trades, he is not satisfied that it is perfect in all cases. The cyclones are already wearing out by the constant whirling of the dust round the inside, and the corrosion on the outside by the weather. As a substitute for these, brick chambers have been built, connected by a pipe to the chimney stack. They appear to be satisfactory, and to prevent the dust from escaping into the atmosphere.

He regrets that the workmen themselves do not carry out their share of the duties to the full extent, and finds exhaust ducts stopped up owing to improper things being allowed to enter; hoods not properly adjusted; glass in the hoods broken; and sometimes grinding being done with the valve between the hood and the duct closed.

Again, in those places where respirators have to be used, men are frequently found racing stones without them, and others working in the room at the same time. The weekly cleaning does not appear to be done as regularly as it should be done, though special visits of inspection are paid for the purpose of enforcing it.

DONT'S FOR CRANEMEN.

S. F. MATHENY, crane foreman, contributes the following "Dont's for Cranemen" in a recent issue of the Inland Steel Co. "Safety Bulletin":—

Don't fail to ring your bell when moving the crane or hoisting a load.

Don't hoist loads not in line with the trolley.

Don't lower material into a car until you are certain there is no one in the car in a position to be injured.

Don't move any load without a signal from the proper man. Recognize the signal from one man only.

Don't hold loads with magnets above persons on the ground or above points where persons may walk.

Don't go on the crane runway or cross from one crane to another by walking on the crane runway.

Don't use your crane to move cars.

Don't allow men to ride on a load carried by the crane or on crane hooks or trolley. Refuse to move.

Don't drag slings, chains or cables. Carry them high enough to clear men and machinery on the floor.

Don't fail to have the burden block as low as possible when working on the hoist or removing the armature.

Don't go, or permit any one else to go, on top of the crane without opening the safety switch on top of the crane, and placing a "Danger—Do Not Move" sign on the switch.

Don't close a switch until you are sure it is safe to do so. Examine the trolley carefully.

Don't fail to test the hoist brake when handling heavy loads, particularly hot metal, by throwing the controller "off" position after the load has been lifted a few inches; if the brake does not hold the load, do not move the crane until it has been repaired or adjusted.

ENAMEL FOR SHEET STEEL.

SOME interesting information on the enameling of sheet steel was recently contributed by Robert D. Landrum, to the Journal of Industrial and Engineering Chemistry. After dealing with the great amount of secretiveness which has surrounded this industry, not alone regarding the materials entering into the enameling compound, but also as regards the weights of the constituent parts, he outlines something of the preparation of the material. This part of the article is as follows:—

Preparation of the Material.

The raw materials in due proportions are emptied on a maple floor, and thoroughly mixed by shoveling. Elevators then take the materials up to bins, from which they are discharged in melts of about 1,200 lb. into tank furnaces of the regenerative reverberatory type, which are best heated with gas (natural gas or producer gas) up to 1,000 deg. (for glazes), or to 1,300 deg. C. (for ground coats).

The hot melt is discharged into cold water; a violent reaction ensues, and the flux is broken up into small particles full of cracks. This quenching is to toughen the "enamel frit" and to facilitate the grinding, which takes place in large ball mills, with cylinders up to 6ft. in diameter, lined with porcelain. By 30 hours' grinding, the mixture of enamel, together with flints, clay, tin oxide, and half of its mass of water, is turned into a creamy fluid, which is allowed to age in tanks for a week or so. It then passes to the dipping-room into shallow troughs sunk into the tables, which are provided with slushers. The slusher takes the stamped sheets or utensils and coats them with the cream; the article is afterward placed bottom downward on three steel points to dry. When thoroughly dry, the articles are passed into muffle furnaces, where the enamel fuses or coalesces at about 1,000 deg. C.

Thus the first coat is prepared, which is frequently black, because oxides of nickel and cobalt are added to increase the adhesion to the steel. To apply a second and a third coating the article is returned to the dipping-room. The dried but not yet baked articles must be handled very carefully, lest some of the dry powder come off. Creams for mottled enamels are applied by means of atomizers. Waste materials from the floors and from the water-settling tanks are carefully collected and utilised in making cheap goods.

Steel Constituent.

The steel on which the enamel is to be coated should, as nearly as possible, be free from carbon, silicon, sulphur, and phosphorus, and should not contain more than 0.2 per cent. of manganese. When the articles are stamped, a lubricant is used which can be easily wiped off, and heating is avoided; ears, handles etc., are welded on rather than riveted, because riveted portions do not take the enamel well. The article is afterward well annealed at low-red heat, pickled in hot sulphuric acid, rinsed in water and weak alkali, and quickly dried. It is then ready for enameling.—Iron Age.

BOILER BAGGING.

THE majority of the reported cases of boiler bagging are due to the presence of scale or oil in the boiler, states a writer in the "Power User." The removal of the former may be accomplished by what has been termed the "periodically clean" method—that is to say, by the use of mechanical cleaning methods each time the boiler is opened up for inspection, by the introduction of boiler compounds, or by treating the feed water chemically.

No amount of chemical treatment will remove oil from feed water, however, and some mechanical filtering process must be relied upon for its elimination. Some engineers favour cloth filters and some sawdust, sand or other substances; but most depends upon the design of the filter itself, and individual manufacturers of these apparatus may be relied upon to adopt the filtering medium which is best suited to their own construction.

With regard to the comparative harmful properties of various oils, the most dangerous bags and blisters are generally caused by animal and vegetable compounds, with or without the additional presence of scale. Attempts to boil them out with soda or some alkali are to be severely condemned as rendering the oils more dangerous still. As has been stated, no amount of boiler compound can counteract the ill effects of oil entrained in feed water, it being imperative that some external mechanical means be adopted when it is present.

Free Pig Iron Proposal.—The chief difference of opinion between the U. S. House of Representatives and the Senate over the Tariff Bill is due to the proposal to put pig iron and other coarse grades of iron and ferro-manganese on the free list. The Senators think this would result in too great a sacrifice of revenue.

Observations Concerning Current Gas Engine Practice*

By W. Fennell, M.I.E.E.

The author of this paper discusses in a clear and convincing manner the position of the gas engine as we find it to-day, and at the same time gives prominence to much valuable data, whereby those engaged in or about to engage in the manufacture of this power unit, large and small, may have imparted to them a clearer conception of successful product requirement.

I SHALL confine my remarks to engines of from 12 in. to 36 in. diameter pistons, or, in other words, to medium powers, such as would be met with in stations up to 3,000 kilowatt capacity. In the first place, I would divide the types into two and four cycle, and it must, I think, be admitted that at present the two-cycle engine is in the experimental stage. The two-cycle engine should be cheap, but it is not at present very much cheaper than the four-cycle. I think this is because no maker has succeeded in producing a commercial two-cycle engine without gas and air pumps. Motor car and other small engines have been so made, using the crankcase as the displacing cylinder, but one does not like to contemplate a back fire in a 500 h.p. crankcase.

Two-Cycle Engine Features.

The first advantage claimed for a two-cycle engine is the absence of exhaust valves. The piston on its outward path uncovers the exhaust ports, but much of the apparent advantage disappears when one has had experience with large exhaust valves. I think the question of exhaust valve leakages is unduly important in our minds. Every man who owns a motor car has valve leakages as a nightmare. In large engines, the valves do not need much grinding in, as a slight leak is not serious. The volume of charge is so great that only a small percentage can escape even if the valve "fits where it touches." I should not, therefore, give much heed to absence of exhaust or of inlet valves and the troubles with them, unless convinced that there would be less trouble with gas and air pumps and their valves. I should also ask for proof that the two-cycle engine is cheaper to run than the four-cycle, taking interest and depreciation, fuel cost, lubrication and repairs.

Another point to consider is heating—there are, other things being the same, twice as many explosions as with four-cycle. This means that for a given cylinder area and piston speed we have to get rid of twice as much heat. Are we able to do it without overheating or without excessive casting strains? What value the exhaust and suction strokes on a four-cycle engine have in preserving lubrication, and in reducing skin temperatures of cylinders and piston rings can only be surmised until we have more experience of large two-cycle engines running without these two "idle strokes."'

With regard to mechanical efficiency this should be to the credit of the two-cycle if the inefficiency of the pumps does not destroy it. The effect on economy is, therefore, rather involved—we know that the power output is increased for the same cylinder volume, and we must set the undoubted economy against the loss due to part of the charge getting away at a time of exhaust and admission. The following are representative "best" figures for engines of 400 B.H.P.:—

4-cycle, 9,000 B.T.U.'s = 67 ft. of 135 B.T.U. producer gas per B.H.P. hour.

2-cycle, 10,500 B.T.U.'s=78 ft. of 135 B.T.U. producer gas per B.H.P. hour.

I look to the future of the two-cycle engine as being bright, but it will have a hard fight against the established position of the four-cycle engine.

Vertical v. Horizontal.

It is unfortunate that vertical engine makers will insist on running at high speeds—not high piston speeds, but high revolution. In all well-known types, we have to consider high speed vertical versus slow speed horizontal. This confuses the question, and is apt to mislead one. It is the old battle of the steam engine types over again, and the result may be the same. Just as the steam turbine came in and disposed of the question of steam engine types in large sizes, the gas turbine will possibly settle the question of vertical and horizontal gas engines.

The first engines were horizontal, and because there was trouble due to cylinder wear, some thought it was the weight of the piston which had something to do with it. A very elementary calculation shows, however, that the forces due to angularity of the connecting rod so greatly exceed the weight of the piston that the latter can be ignored. Vertical engines, being restricted in height by practical considerations, usually have shorter connecting rods than horizontal, so that the side thrust is greater. It is clear that gravity takes so little part in the question that whether you run an engine on its side or on its end or upside down, it makes little difference to piston and cylinder wear.

There is another and much more important cause of wear on the cylinder walls than weight, and perhaps even the thrust. If one imagines the piston a little smaller than the cylinder, and again, if one imagines that the piston rings do not fit very well, we get a space on the side opposite to the thrust, and in this space we get pressure approaching that of the explosion. A very slight consideration of the matter shows that we may get a very large force assisting the thrust. I have more than a suspicion that the idea of splash lubrication was the real inducement to the modern designer of vertical engines, both steam and gas, but splash lubrication is dead.

Vertical Engine Advantages.

There are one or two points in favor of the vertical engine, and these are questions of:—

(1)—Expansion.—The cylinder can be supported on one end, and so may grow vertically without restriction.

(2)—Lubrication.—The oil leaking from the little end and splashing from the big end will tend to run away from the cylinder and so restrict, and perhaps prevent, over-lubrication. The difficulty to-day is not to get enough oil, but to restrict it.

(3)—Small ground space occupied.

Vertical Engine Disadvantages.

The disadvantages of vertical engines are the necessity for restricting the dimensions of the crank chamber, due to considerations of strength, and consequently absence of room to get at the working parts; the fact that burnt oil and tar is constantly collecting on the piston head and is forced down between, the piston and cylinder and behind the rings, and the temptation to high rotation speeds and short stroke, owing to the need for restricting height.

Vibration also is a more serious question where the forces are vertical—it is almost impossible to prevent transmission of vertical vibration from the bed to the ground. In a horizontal engine, one could put the underbed on rollers, but one could hardly support a vertical engine on springs. I know that cork

*From a paper read before the Birmingham District Electric Club on March 8th, 1913.

and rubber cushions have been used, but they are not, in my opinion, a practical solution of the problem of transmitted vibrations for large engines. The cost is very great, and deterioration must be fairly rapid.

Having indicated the fallacy of saying much on this question, I would like to say that, to my mind, the reciprocating gas engine is made vertical or horizontal just as fancy leads the maker, and it should be bought entirely on the question of cost of or availability of land. If one has cheap land available, it is of no real consequence.

Balancing of Engines.

In many cases we must avoid transmitted vibration, and the question of balancing of engines comes very forcibly before one. There are two or three propositions which should be laid down although I don't intend to prove them here.

(1) Unbalanced reciprocating masses can only be half balanced by weights on crankshaft.

(2) It is not enough to consider balance in two planes, but one must take three dimensions. That is, it is not enough to take two cranks at 180 deg. and say we get balance, because the pistons move in opposite directions.

(3) The out-of-balance forces increase in proportion to the speed squared.

(4) The forces of explosion have little or no effect on the question when one is considering vibrations external to the engine.

These elementary principles are not realized as fully as they might be. The out of balance forces are large in gas engines because pistons and connecting rods have to be heavy, and the piston speed must be high. From the above it follows that a single crank engine cannot be in balance. The best one can do is to resolve the unbalanced reciprocating forces into two, each half the amount, the one horizontal and the other vertical.

A two-crank engine, although nearly balanced vertically and horizontally has a rocking out of balance around a plane at right angles to the line of crankshaft, and parallel to and between the two cylinders. The nearer together the cranks can be got, the better the balance will be. The type in which there is a centre flywheel or a generator, and there are two lines of pistons, one on each side, is about as bad as can be from the point of view of balance. A two-crank engine with cylinders in line and pistons going in opposite directions is very good as far as balance is concerned, but is weak mechanically.

A four-crank engine can be nearly balanced if the two centre cranks are at 180 deg. with the two outside ones. A three-crank engine can also be nearly balanced in all planes. These few notes may serve as a guide in deciding types of engine for difficult situations.

Turning Moment.

Evenness of turning moment may be obtained by either multiplicity of cylinders or by heavy flywheels. This being the case, it is a question not for the purchaser, but for the engine maker. For electrical work, a cyclic variation of 1-150 is the worst that should be tolerated, and for A.C. work, 1-300 is the maximum which can be allowed.

Purchasers should forbid the use of two flywheels, one on each end of shaft. These tend to cause racking strains and shaft breakages. The flywheel should be the driving pulley itself, or close up to it. Breakages of crankshafts have practically ceased since the use of two flywheels have been abandoned.

Cylinder Construction.

This is one of the most difficult questions which the engine designer has to face. The difficulty is that the inside wall must be hot while the outer portions are cold. Then again, the compression space is hotter than the other portions of the cylinder. The exhaust outlet is subject to a higher temperature than the inlet. One also has to deal with cast iron, itself a metal particularly liable to initial casting strains, and very brittle anyway. The wonder is not that cylinder and jackets crack, but that they stand as well as they do.

Each maker has his own ideas of cylinder construction and support, but there are few who have really solved the question. The following points are important:—All inlets to compression space passing through the water jacket should be fixed to the cylinder only and be packed where they pass through the outer jacket. In multi-cylinder engines, the exhaust branch pipes should be long, and enter separately into the exhaust mines—or if this is not possible, then the exhaust manifold should be provided with expansion joints between each cylinder.

Cylinder liners are not often used in high-speed engines, and they are of doubtful use in low-speed engines. There is a difficulty in securing contact between a liner and the main casting, and there is a distinct risk of deformation. Practice is now fairly established in the direction of reducing cylinder wear, not in providing for renewal of wearing surfaces. In one make of engine (the "Premier") there is a liner of a most ingenious construction, in which the liner is the cylinder itself, and is separate from the outer casing of the water jacket, to which it is bolted at the combustion end. The liner passes through a gland at the outer end of the jacket, and the combustion chamber is bolted to the liner. This is the most perfect cylinder construction I have seen for a single-acting engine.

Cylinder Support.—The usual practice is to fix the cylinder at the outer end only, leaving it free to expand towards the combustion space end. With large horizontal cylinders the back end of the cylinder must be supported, but not fixed, so that it is free to expand and contract, but not to droop.

The exact shape and design of pistons is also a very delicate matter, especially in simple pistons not water-cooled. In the piston construction will be found the key to the success or failure of engines, say, 12 in. to 3 ft. bore. Some makers attempt to use uncooled pistons of 18 in. diameter, but this is, I think, a great mistake. My experience is decidedly against large uncooled pistons, and I should say that 12 inches in four-cycle gas engines and 9 inches in others is the limit for non-cooled pistons. If one considers what goes on in a gas engine cylinder, the reason for this statement becomes clear.

On the compression stroke there is a leakage of mixture past the piston, carrying with it oil and tar and grit, which work behind the piston rings. All along the compression stroke, the piston is overtaking the cylinder walls, i.e., collecting dirt from them. At the end of that stroke, the temperature has risen, and then with ignition there is still greater rise of temperature, and on the explosion stroke the oil on the walls is probably burnt, and then on the exhaust stroke is again swept up by the piston. The result is that with a hot piston head, hotter than the distilling point of the tar and oil, there is a constant transfer of thick oily matter to the clearance behind piston rings.

If the temperature gets above a certain point at the first ring, the thick oil and tar coke and become "carbon." This carbon forces out the piston ring and sets it hard, causing excessive friction and final seizing of the piston. It is here that one feels the disadvantage of multiple cylinders. Where the engine drives a dynamo in parallel with others, or a battery, the reduced speed causes the dynamo to drop the whole of its load, so that the whole power is available to do damage. In a single-cylinder engine the seizure stops the engine, and the mischief is usually confined to a second cylinder wall, but in a multiple, say 4 or 6 cylinder engine, there are five other cylinders working, forcing the sixth piston over its cylinder surface, with the result that the cylinder wall is torn to such an extent that the cracks go right through, and if one is not very lucky, the connecting rod of the seized piston will buckle, or some other part will give way, wrecking the engine.

So many Diesel engines have been entirely wrecked from this cause, that the insurance companies are refusing to insure them. Certain types of high-speed gas engines are also liable to the same defect, and I am strongly of opinion that no large engine design can survive unless it has water-cooled pistons. It is strange that so great a trouble arises from such a small cause, viz., a piston head hotter than the burning point of oil and tar.

Valves.

As before indicated, I do not feel at all nervous over valves. They are now made non-water-cooled in all sizes. Cast iron faces with steel spindles and heads are standard practice for exhaust, while steel valves are usual for inlets. With heavy heads and long spindles well shielded from exhaust gases, there is no real trouble, i.e., the defect is hardly discovered until overhauling, when it is found that the face of the valve has a hole in it. Flat-faced valves are often used for exhaust and mitre faces for inlet valves, but the mitre seat gives the best shape of outlet, reducing throttling of the gases passing through. It is important that the cams be arranged to drop the valves lightly in the seat, and in many slow speed engines we have the rolling lever and eccentric gear for this purpose.

Lubrication.

The lubrication of a gas engine requires special care and much forethought. The cylinder lubrication in particular is a very awkward matter. It must be admitted that there is no oil which will stand the temperature of burning gases, and there can hardly ever be one. One might hope for an oil which would burn away, leaving no deposit, and until this appears we shall continue to have serious trouble with gas engine lubrication.

There is no doubt that any attempt to utilize splash lubrication for cylinders is a failure; one cannot control it, and too much oil is as bad as too little. Every vertical engine I know but one (and that a very expensive one) has a trunk piston, and, as a consequence, the oil from the big and little end splashes on to the cylinder walls, causing over-lubrication. Baffles are usually put to reduce the amount of oil reaching the walls, but this is after all a crude method of control.

I am strongly of opinion that the successful engine of the present and of the future must have a crosshead, whether single or double-acting, horizontal or vertical. The crosshead must be a reasonable distance from the piston, so that oil will not splash on the cylinder walls, and one may then control the lubrication of the cylinder to a nicety. The crosshead also facilitates piston cooling, as there is more room for gear to get the water to and from the piston. There is no doubt that the lubrication of a horizontal piston is easier than that of a vertical type; in the horizontal piston if one delivers oil on the top there is little fear of the oil missing the bottom; it is bound to work down. In vertical engines, the oil should be fed to at least three or four points around the cylinder, and it must, of course, be forced in.

With reference to lubrication of engine bearings, the practice of Browett, Lindley and Bellis cannot be improved upon very much, but I should like to see the pumps external to the engine, and there should be oil coolers for large enclosed engines. The level of oil in the crankcase should be well below the cranks and balance weights, but lack of room often results in this being sacrificed. If, however, there is an oil tank external to the crankcase from which the pump sucks, and to which the oil returns, there need be no oil retained in the crankcase, and there is no fear then of large quantities of oil being picked up or blown up into the cylinders. The average vertical engine crankcase gets into a filthy condition, as it cannot be cleaned out easily, owing to the strengthening webs.

Governing.

There is no doubt that the best combination is quality governing from full to two-thirds load, with throttle governing below that, or what comes to the same thing, govern on the gas down to two-thirds load, and on air and gas after that. By this means, one runs on a good mixture at all times, retaining the thermal advantages of full compression at all but the lower loads, while at the lower loads there is a good mixture, no risk of misfiring, and consequent irregularity of running. One must, therefore, choose the system of governing to suit the conditions. It is, however, unnecessary to complicate the governing system, if one is not going to run much at under two-thirds load.

Ignition.

There is one very interesting point with regard to earth returns on ignition systems. It is absolutely necessary to provide a substantial return from the lay shaft to the frame. It is almost unbelievable that the lubrication of the bearings, etc., is, in the best engines, so perfect that there is no metallic contact between the moving and fixed parts of an engine. I have been compelled to fix substantial earthing brushes in several cases after an engine has been running a few weeks. These brushes get neglected, and for this reason should be in duplicate, and should be quite as mechanical as the main contact brushes.

Starting.

Large engines to-day are always started with compressed air, usually for producer gas engines, at about 250 to 300 lbs. per square inch. In large cylinders, care is taken that no gas enters that cylinder until the air is shut off, but in smaller ones, the risk of a heavy pressure due to firing at 300 lbs. compression is taken. The chief point to safeguard in this matter is to have plenty of air storage, and, if possible, two compressors, to allow of three or four attempts in the event of the ignition being out of adjustment. Arrangements to use the compression of the engine to fill the tanks on shutting down are dangerous; gas may accidentally be mixed with the air.

Water Circulation.

A very few remarks on this subject will suffice. Circulating tanks are out of the question for large engines, so it becomes necessary to adopt some more compact form of cooler. There are several types of rotary coolers, in which a fan forces air over rotating surfaces dipping into the water. Again, one can employ cooling towers, which are very efficient, and the loss of water is little. Rivers, canals, or cooling ponds can rarely be used to-day, and tanks on the roof are very expensive. Speaking generally, one must force the circulation, and to do this a pump is required. This pump should not be driven from the engine; it is an absurdity to be compelled to shut down a large engine because a belt slips or breaks. There should always be a reserve from the water company, if sufficient can be obtained to supply the engine, or there should be a reserve pump.

I lay great stress on this question of water supply, because it is the weak point of most gas engine installations. There is no need to-day to put in ram pumps. For heads up to 30 ft., the new types of centrifugal and turbine pumps are more efficient, less likely to go wrong, and less expensive. There should be thermometers on the water outlets from various parts of the engine, and pressure gauges on inlet and outlet.

Metal Furniture.—The use of metal furniture in the offices of American street railways and other public companies appears to be gaining favor. Furniture of this kind is not much more expensive than wooden furniture of good quality, but it is more substantial, fireproof, and serves materially to reduce the rate of insurance. It is especially adapted for the storage of unimportant records.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

GRINDING WORK ON AN ENGINE LATHE.

By H. Womersley.

MUCH has been written on the subject of grinding, and opinions differ somewhat as to the success of a grinding system. My opinion is that, if properly supervised, grinding is a means whereby production can be increased in quality and quantity, and the arrangement here illustrated will help the small business man to more successfully compete with the larger concerns.

On certain work we had to do the firm got instructions that it must be hard and ground to a limit. The quantity did not, however, warrant the purchase of a grinding machine. The manager and I, therefore, drew up a sketch, and decided to rig up an engine lathe to do the work. It turned out to be a great success, for eventually orders came in so fast that the firm found it necessary to buy a grinding machine, but at the present time the attachment is being used to help the grinder to cope with the work. I might say that this particular firm is a leader in producing a certain class of machine and is known all over the world.

I afterwards introduced the scheme to a tramway manager, and he used it very successfully to grind armature commutators. I had another engineering friend, and he was a works manager. I used to visit his works very regularly, and noticed he got work which needed grinding. I suggested to him this rig up, but he declined the advice. A few weeks later six hardened collars came to his works to have .015 in. taken out of the bore. He first tried lapping out the holes, but found it unsatisfactory. His second method was as disastrous as the first. He got the collars annealed, then

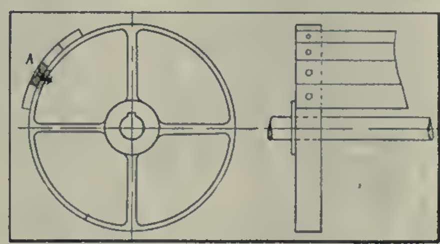


FIG. 6—GRINDING ON AN ENGINE LATHE.

bored a little out of the hole, rehardened, and finally polished up with emery. As a result, the workman was disappointed, likewise the manager, and the man who gave the order doubly so, because he had to pay an excess price and nearly got his job scrapped. Needless to say, no more orders came from that source.

My advice is, if you have not a grinding arrangement, rig one up at once. Do your own ordinary work on it, then when special orders come along you will not be found wanting, but will prove that you are moving with the times, and able to produce a well finished article. I could give a number of instances to prove this is a practical idea and not theoretical, but enough has been said from that point of view. Study what I say, weigh it up in your own mind, and ask yourself will it apply to my work? Try it, as it is not an expensive venture, and let the result be your guide for future action. It is quite possible it will be the foundation for a successful period of trade, because to be successful we must move with the times.

The Lathe Feature.

In choosing the engine lathe to do the grinding, choose one of rigid construction. See that it is fixed to a solid floor, because rigidity is essential for efficient grinding. Having chosen this lathe, get a casting made, as shown in Fig. 2. When machining this casting, make the bearing nearest the grinding wheel 1/8 in. larger than the other as shown. Drill holes at other end of casting to suit compound rest. Make bushes and fit as shown. The grub screw (A) keeps bush in position, and (B) shows bush with saw gauge through it. A distance piece (C) takes up wear in bearing, and Fig. 4 shows pulley for spindle. Fig. 5 shows wheel spindle, which, if for

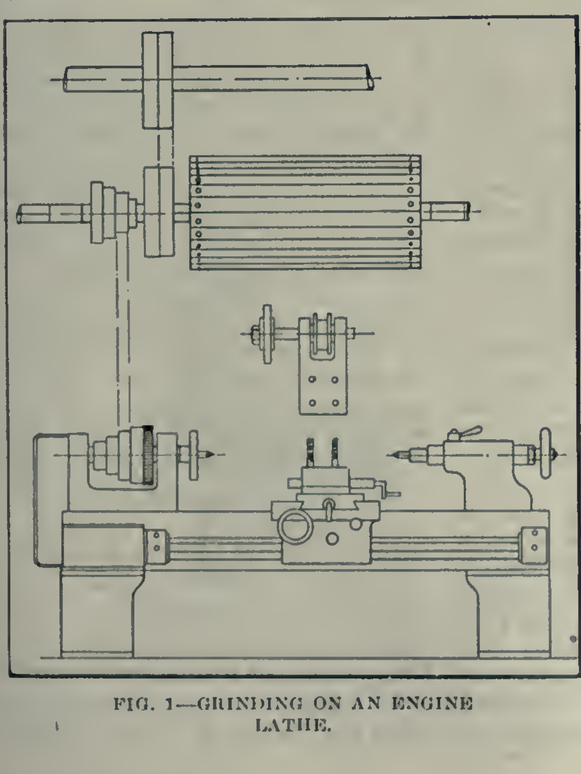
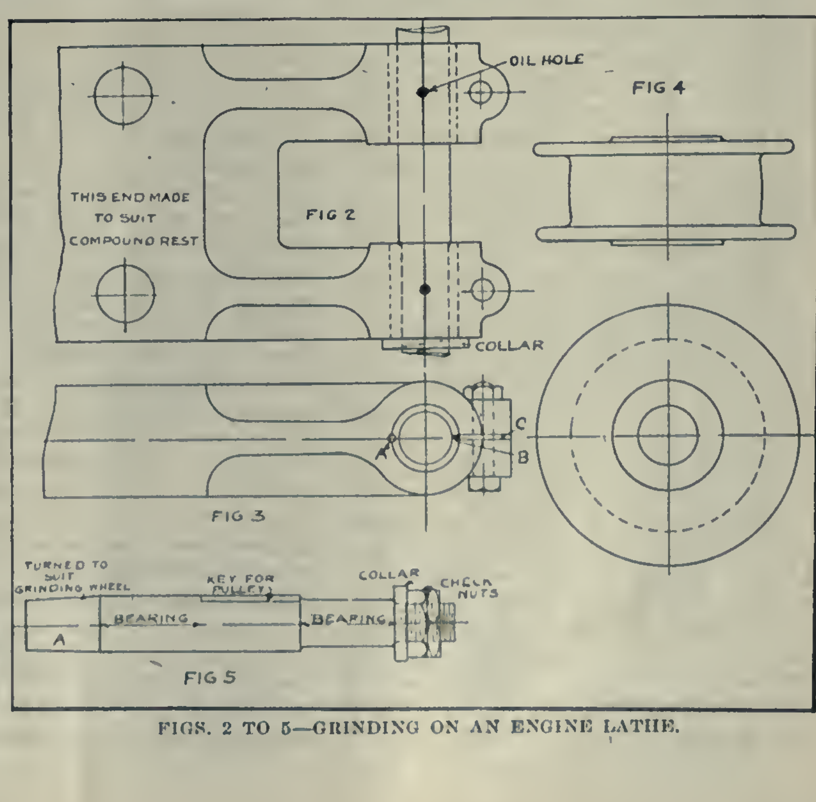


FIG. 1—GRINDING ON AN ENGINE LATHE.



FIGS. 2 TO 5—GRINDING ON AN ENGINE LATHE.

internal grinding, and where marked (A) must be long, while for external work it must be short. Fig. 6 shows drum, which consists of two pulleys, keyed to counter-shaft and built up with wood, as shown at (A). A pump will also be required, but that can be arranged to suit different classes of lathes used. In Fig. 1 a general view is shown.

Grinding Wheel Notes.

A few words about grinding wheels will not be out of place here, and an idea of what grinding wheels are made from, and the terms connected with them, are necessary to aid in their proper selection. A grinding wheel consists of crushed abrasive, held together with an adhesive substance known as bond. There are two kinds of abrasives—natural and artificial. Emery and corundum belong to the natural class. Both are mineral substances and alike, only emery is not as pure as corundum, and contains a large percentage of iron, which is an undesirable element in a grinding wheel. In the artificial class we have alundum and carborundum. Both are products of intense heat in an electric furnace. Alundum is made from Bauxete, which is found in France and the Southern United States, while corborundum is made from coke, sand, salt and sawdust. The natural class is of tougher substance than the artificial, while the carborundum crystal is the hardest known excepting the diamond.

All abrasives are screened through sieves of different mesh per sq. in., and the fineness of the particles is designated as grain. Thus a 36-grain abrasive is one that will just pass through a screen having 36 meshes to the sq. in. The adhesive substance is usually composed of either shellac, silicate of soda or clays. The adhesive substance of a wheel has an office other than that of merely holding the particles of abrasive together. It determines how strongly the particles are held together, and this is a very essential factor in the selection of wheels. Wheels from which the grit is readily torn out during operation are known as soft grade wheels, and those that strongly retain the grit are called hard grade. Grade and grain of grinding wheels should not be confused. Grade refers to hardness or softness of the wheel, while grain is used to designate the size of particles of abrasive that enter into its construction.

The theory of action of a perfect grinding wheel is that, as the cutting points wear or become dulled, they will loosen from the bond and fall away from the surface of the wheel, allowing the sharp points that are below to come into action. This uniform wearing of the wheel allows it to cut freely with little heat, and better maintain a given size of the work.

In concluding, I would say, hard grade wheels are best for carbon and soft steel. Medium grade wheels should be used for high carbon steel, hard steel and cast iron. Soft grade wheels should be used for grinding brass, because a hard grade wheel is apt to heat the work, causing distortion and consequent inaccuracy.

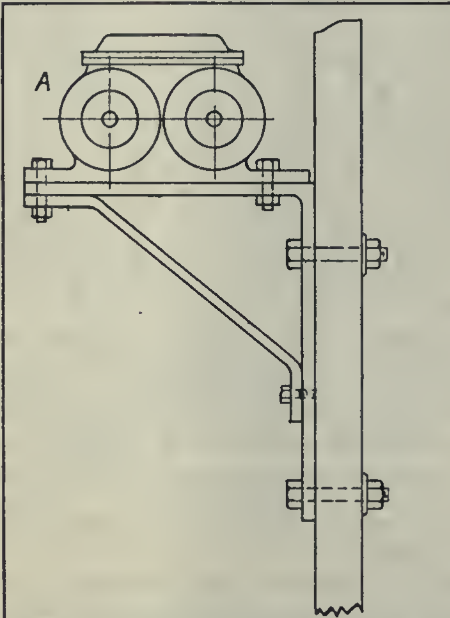


FIG. 1. BRACKET SUPPORT FOR PUMP.

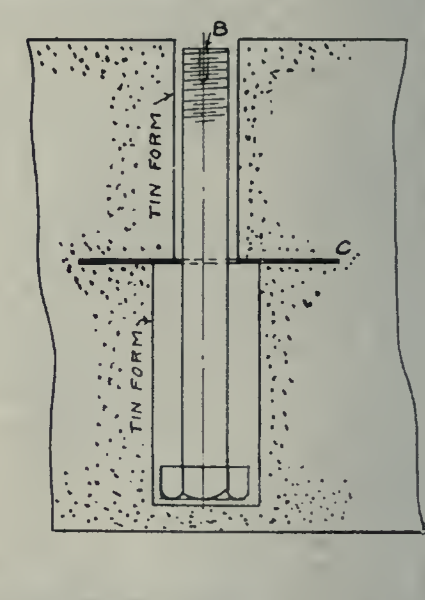


FIG. 2. FOUNDATION BOLT KINK.

POWER PLANT WRINKLES.

By John Thorn.

IN many small plants the engineer will do odd jobs of brick work around the engine or boiler room, and especially so if he has a fireman who is trustworthy and capable of looking after the machines occasionally when the engineer is busy elsewhere.

Now I imagine it is a mistake for any engineer to do this kind of work unless he understands how to do cement mixing properly, for I believe nothing but cement mortar should be used in foundation work of any kind, brick, stone or grout. Some engineers will build a foundation from the floor up for any and every piece of apparatus, no matter how small, but this is a mistake, as it takes considerable work to keep the apparatus clean, in many cases the foundation making it difficult to get at the bottom of the machine properly, therefore dust or other dirt and oil get a chance to collect.

In the plant where I am at present employed we have several duplex and Northey boiler feed pumps supported by brackets made of iron, as shown in Fig. 1. A glance will show the reader that it is a snap to keep things clean around them. I believe the brackets have been there for about 20 years, for to my own knowledge they have been there 11 years, and so far as I can see they are as good and firm to-day as the day I first saw them.

Another good wrinkle I saw used at the C. G. E. Co. works at Peterboro is shown in Fig. 2. When building a foundation for a heavy machine, the bolts are generally cemented in with the thread end projecting above the foundation the length necessary to pass through the machine base. Should the machine weigh some tons, great care has to be exercised so that while placing it in position none of the bolt threads are injured, and to overcome this danger make two tin forms, or two pieces of iron pipe of the right diameter will do. The bottom one should be big enough to allow the bolt head to pass through and be as long as the depth of the machine base, while the top one should be as long as you wish the concrete to be between the machine and the foundation bolt head. Between the two should be inserted an iron plate with a hole drilled in the centre to allow the bolt to pass through, as shown at (C). At (B) a small hole is drilled and threaded in the centre of the foundation bolt. When the machine is in place, a small threaded rod can be screwed into the hole (B), and the bolt pulled up until the head comes against the iron plate (C). This makes an ideal device to use for a machine which has to be removed at times.

DRILLING MACHINE ATTACHMENT.

By H. Womersley.

RECENTLY we had an order whereby a lot of holes had to be drilled under flanges, as shown in Fig. 1, which shows a valve chest with multiple valves.

Sometimes we have a chest with two valve seats, and sometimes with six valve seats. The way we proceeded to do the job was by making an attachment as shown in Fig. 2.

Attachment Details.

Secure two pieces of mild steel and machine on faces, as shown. Clamp together and drill shaft, column and bridge holes. Next fit the brass bushes in check plates, and do not forget the lubricating holes. Fix collar to feed screw with taper pin. Next make columns or distance pieces, the shoulders on these being so as to just keep gear wheels free.

The combination shaft and socket must be made from good material, owing to its being subject to ill-usage. Make socket to suit No. 1. Fix the intermediate and socket gear wheels with a key to shafts. Make the driving shaft from mild steel, and fit the taper to suit drilling machine spindle. The feather way must be cut the whole length of shaft. Fit the feather in gear wheel.

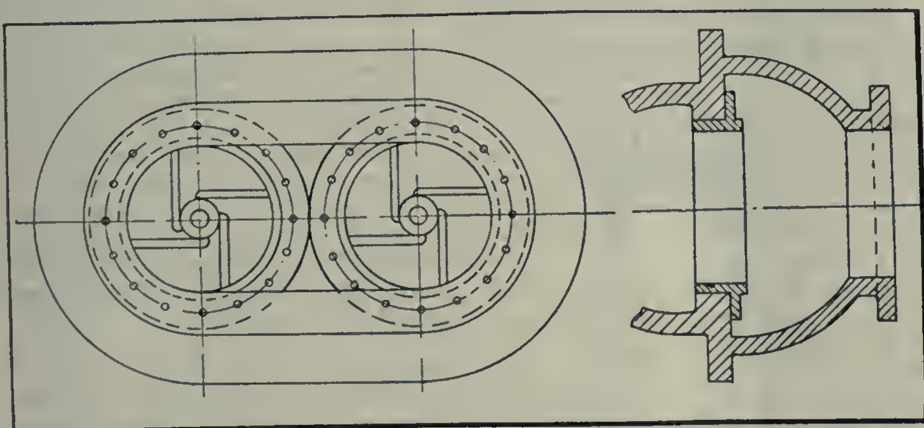


FIG. 1—DRILLING MACHINE ATTACHMENT.

The feed screw is an ordinary Whitworth thread with a collar fitted on the end and held in position with a taper pin, while the bridge is easy to make, it being held in position by two quarter set screws. The thrust plate is of mild steel, with a hole tapped out to suit feed screw, and made long enough to clamp to steam chest flange.

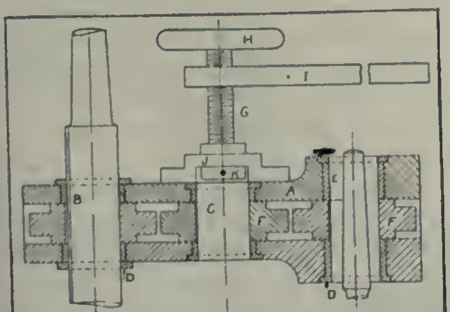


FIG. 2—DRILLING MACHINE ATTACHMENT.

When finished, do not forget to cover gears with planished steel to avoid accidents. All is now ready for drilling. I generally use valve seat as a jig for the holes.

This is a very efficient attachment, and anyone using it will find it a paying investment.

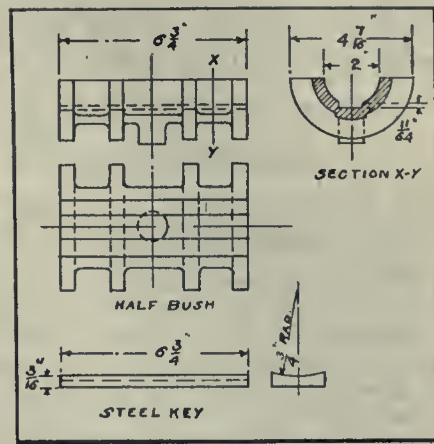
ELIMINATING THE WEAKEST LINK.

By George Black.

IN seeking to operate machine tools at their highest efficiency, commensurate with their depreciation, the weakest link of the chain is constantly in evidence. In that of transmission, we frequently find it in a main drive pulley slipping on the shaft, due to the extra power required to pull the increased speeds and feeds, made possible by the higher efficiency of machine tools and tool steels. The slipping scores the shaft and cuts up the cast iron bush, making it necessary to tighten the bolts.

The capacity to drive is reduced each time the pulley slips, owing to the before mentioned scoring and cutting action, between the shaft and bushing, and the application of emery cloth between them only gives temporary relief, for if the pulley is being overloaded, it will not drive satisfactorily either by increased tension on the bolts or the introduction of emery cloth.

The sketch shows a method of effectually eliminating the trouble, which in this case was caused by operating 7-24 in. Bullard vertical turret lathes at their capacity on a particular class of work, and was applied to a 2 in. diameter shaft. The pulley and bush were removed, and in each half of the latter a shallow keyward was cut and key fitted, as per sketch. The point to watch is that the radius of the curve in the key is less than that of the shaft to which it is to be applied. The pulley and bush on being applied to shaft and tightened thereon forces the sharp edges of the key into the shaft and the trouble caused by the overload is transferred to probably the unfortunate belt man.



ELIMINATING THE WEAKEST LINK.

BOILER EXPLOSIONS FROM SHORTNESS OF WATER.

By William Buchan.

BOILER explosions from shortness of water would be materially reduced if attendants, instead of opening only the drain taps of water gauges, tested them daily in the following manner to ensure that both the steam and water passages were perfectly clear: (1)—Shut top tap. (2)—Open drain tap; a full flow of water shows that the water passage is quite clear. (3)—Shut bottom tap. (4)—Open top tap; a full flow of steam shows that the steam passage is also clear. (5)—Shut the drain tap. (6)—Open the bottom tap; the water should not be sluggish in returning to the glass.

These operations involve a certain amount of trouble, but they ensure that the glass will indicate correctly, and also that the taps can be closed should a glass break. Gauges on water-tube boilers are often fitted with special rods and handles, by means of which the taps can be operated either from the floor or platform at the gauge level. A tail pipe fitted to the drain tap, and provided with a valve near the ground level, is an exceedingly useful adjunct for frequent use, but it does not dispense with the regular routine testing referred to above. Where there are a number of high pressure boilers, the risk of scalding can be greatly reduced if the attendant who tests the glasses wears a mask and gauntlets.

The Holden Co., Ltd., has increased its capital from $45,000 to $250,000.

DEVELOPMENTS IN MACHINERY

A Record of New and Improved Machinery Tending Towards Higher Quality and Economical Production in the Machine Shop, Blacksmith Shop or Planing Mill.

OPEN SIDE GRINDING MACHINE FOR PLANE SURFACES.

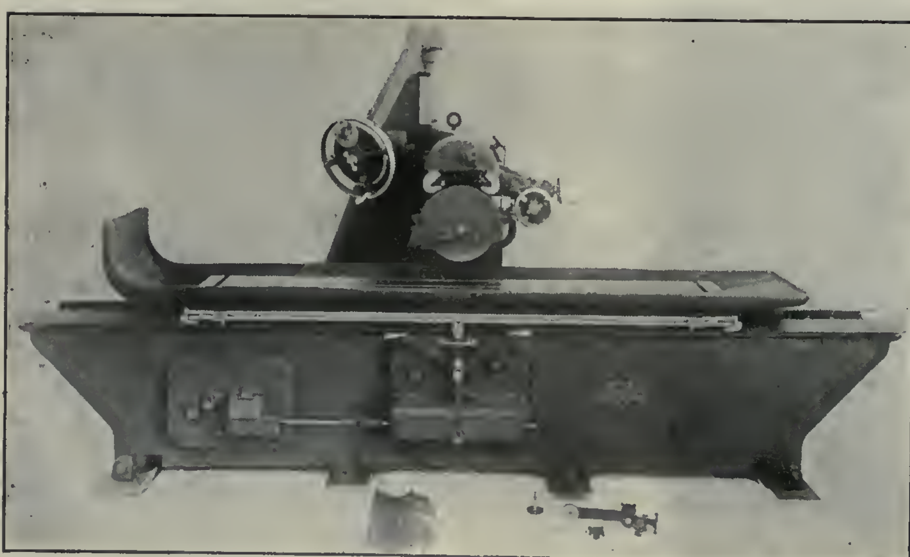
THE working surface of the table is 15 in. wide and 6 ft., 8ft., 10 ft., 12 ft. and 14 ft. long, depending on the length of machine. This entire surface can be ground in place. The wheel head can be raised to give a distance if 17 in. between the surface of the table and a 14 in. diameter wheel, thus making provision for use of magnetic chuck or supplementary table. The machine is designed to carry wheels 14 inches in diameter, and for the ordinary line of work the wheel would be 6 in. face. For special work, wheels of different widths can be furnished.

Experience has taught that, with grinding wheels, the smaller the arc of contact the more efficient the wheel becomes. Wheels of small diameter are, therefore, advocated. This is especially necessary when grinding plane surfaces, as the arc of contact in that case is much greater than when round work is being ground. For the same reason the periphery and not the side of the wheel is used, as with the side of the wheel (ring wheel) or with large arc of contact of the periphery, there is no opportunity for the chips to escape; therefore, heating, undue power consumption, and general inefficiency results. Further, when for any reason the chips cannot escape freely, a neat appearing finished surface cannot be produced.

A counter-shaft is located in the machine base, making the whole self-contained, and power is transmitted to this counter-shaft through a belt from a motor placed at the side of the machine. All overhead works are eliminated. A 15 h.p. motor is recommended for ordinary work.

The grinding wheel is carried on a cross slide operating at right angles with the travel of table, and in order to secure the large production that is made possible by the use of the wide wheel, no automatic feed of the wheel has been provided, a hand traverse having been designed for locating the grinding wheel so as to utilize the full width of wheel face. Provision is also made through worm gearing for the slower traverse of the wheel when truing the wheel face. The cross slide is carried in a vertical slide, which is designed for raising and lowering on the column by means of a ½ h.p. motor through a lever and friction clutch. For small distances, the vertical traverse is obtained by means of a hand wheel on a shaft geared to the vertical traverse screw, and a micrometer index, which registers in one quarter thousandths, provides for delicate adjustments.

The table is provided with tee slots of standard dimensions, which facilitate the strapping of work directly to the table or the application of a supplementary table, special fixtures, or magnetic chuck. The table traverse is obtained by means of worm gearing of the most approved type, thereby giving the table a perfectly smooth motion, which is absolutely essential for the production of a smooth and accurate surface on the work. The reversal of the table is pneumatically cushioned at the ends of the stroke. All kinds of plane surfaces which are within the capacity of the machine can be ground quickly and accurately. The machine can also be used for grinding a variety of shape surfaces, for which class of work a special forming attachment is used to form the wheel face to produce the shape required.



NORTON OPEN SIDE GRINDING MACHINE FOR PLANE SURFACES.

Ball bearings are employed on all shafts operated by hand wheels, and worm and worm wheel shafts are provided with ball thrust bearings, and all worm gearing runs in an oil bath. Worms and wheel spindle are made of chrome nickel vanadium steel, heat treated, and all shaft bearings are ground and run in self-oiling boxes. Special equipment is used in the scraping of the ways in the base, resulting in such accuracy of alignment that when the table has been ground in place it presents a neat and uniform surface, free from chatter marks, and our inspection requires that a B. & S. straight edge the length of the finished table surface shall hold tissue papers 2 in. apart throughout its length at any angle on the table. The machine is supported on adjusting wedges resting on iron plates which are imbedded in a concrete foundation, making it possible to easily re-align the machine should occasion require. A large water tank is provided with a pump, which will deliver 30 gallons of lubricant per minute on the wheel and work.

With the standard machine are included one grinding wheel, one wheel sleeve, all belting, including the main belt from the motor, a suitable equipment of wrenches, oil cans, etc.; also, the ½ h.p. motor for wheel head traverse. The 15 h.p. motor and electrical equipment for same are not supplied.

The Norton Grinding Co., Worcester, Mass., are designers and builders of these machines.

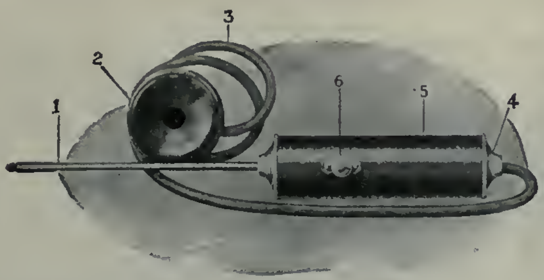
THE DETECTORPHONE.

AN instrument that is, perhaps, not as often met with in Canadian power plants as it deserves to be is the detectorphone, an illustration of which appears herewith. As may be seen from the cut, the instrument is an electrical device consisting of a telephone receiver (2), and an extremely sensitive microphone enclosed with a dry battery in a tube (5). Connected with the microphone is a steel rod (1).

The detectorphone is used to investi-ate conditions existing inside engine ylinders, water pipes, condensers, etc. small knock that would otherwise be uite inaudible is greatly magnified by the microphone, enabling the engineer to form an accurate opinion of what is going on in the cylinder, valve chest, or other part under investigation. In using the instrument the rod (1) is held against the cylinder, etc., and the receiver (2) is applied to the ear, enabling the minutest sound to be clearly heard.

It is claimed that a very little practice with the detectorphone renders an engineer wonderfully expert at diagnosing engine ills. By its use small troubles may be early detected and remedied, whereas, if their existence were unsuspected, they might steadily increase until a serious breakdown occurred.

The detectorphone is handled in Canada by the Maihak Indicator Agency, 3 Beaver Hall Square, Montreal.



THE DETECTORPHONE.

IMPROVED AUTOMATIC WATER GAUGE.

THE improved automatic water gauge here illustrated was designed and patented by The Lunkenheimer Co., of Cincinnati, Ohio, who are its sole manufacturers. We understand that quite a large number are already in use, and that they are giving perfect satisfaction.

The water gauge is made in two patterns, termed "Medium" and "Extra Heavy," intended for 200 and 300 pounds working pressures, respectively. They are made either right or left hand, as desired, to facilitate operation.

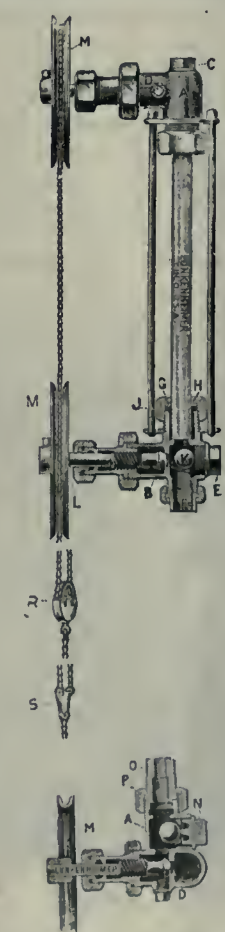
Broken Glass Provision.

Should the gauge glass break, the ball check valves (K) will automatically seat themselves, owing to the rush of steam and water on one side, and the lack of pressure on the other. This automatic closing feature is a valuable one, as it prevents the escape of steam and water, and permits the safe closing of the hand operated valves for the purpose of renewing the glass.

To renew the glass, it is only necessary to loosen the stuffing-boxes (G). take off the cap (C), remove the broken glass and substitute a new one, after which the stuffing-boxes are tightened, and the cap (C) replaced. The change can be performed with perfect safety, for, owing to the quick-closing valves, which should be closed upon the discovery of the broken glass, there is no danger to be anticipated from escaping steam and water.

The Cleaning Feature.

Particular care has been exercised in the design of the gauge to facilitate cleaning, and access can be readily had to any part. The plugs (C), (D), (E) and (N) are provided for this purpose.



IMPROVED AUTOMATIC WATER GAUGE.

By removing the plugs (D) and opening the regrinding valves to their greatest extent, a rod can be inserted entirely through the body and tail pieces, and any sediment that might have collected in or around the entrance of the tail pieces can thereby be easily removed. By unscrewing plugs (E) and (N) the check balls will of their own accord fall from the body, as they rest on inclined surfaces.

Valves Closing Feature.

It has been the practice heretofore to attach both pulleys together by means of a chain or cord, which was pinned to the pulleys, so that the proper closing of one depended entirely on the other. While in some cases this method was satisfactory, it has been found that unless great care was exercised in pinning the chain to the pulleys, or after the valves had been reground several times, one of the valves would not seat properly. To overcome this difficulty, the arrangement illustrated herewith was designed, by which it will be readily seen that both valves can be made to positively seat independently of each other.

The arrangement consists of a block pulley operating over a chain, which is pinned to both the upper and lower pulleys, this method being employed for closing the valves. Should one of the valves become closed before the other, a continued pull on the block chain will close the other. To the left of the pulleys the chain is merely attached to a triangular plate, as the opening of the valves need not be regulated to as fine a degree as the closing thereof.

The valves are constructed on the same principle as the Lunkenheimer well known regrinding valves; therefore, they can easily be reground when worn. The valve seat opening is very large, and consequently a free and unobstructed passage for the water and steam is insured. The gauge cannot show a false level, as the ball checks are so constructed that unless the glass breaks, they will, owing to their weight and position, fall away from their seats.

The Lunkenheimer Company has issued an attractive booklet thoroughly describing and illustrating this gauge, which they are distributing free to anyone desiring a copy. The gauge has been given the trade name of "Monitor."

4 FT. HORIZONTAL SURFACE GRINDER.

THE horizontal grinder which has recently been developed at the Pratt & Whitney Works has been designed for the grinding of flat surfaces, more especially for work with surfaces at various heights and angles. The well known Pratt & Whitney Surface Grinder with cup wheel has been used almost entirely on work where the surfaces to be ground were all in the same plane. There is a great deal of work, however, which cannot be handled with a cup wheel in this manner, due to the fact that the surfaces to be ground are of different heights.

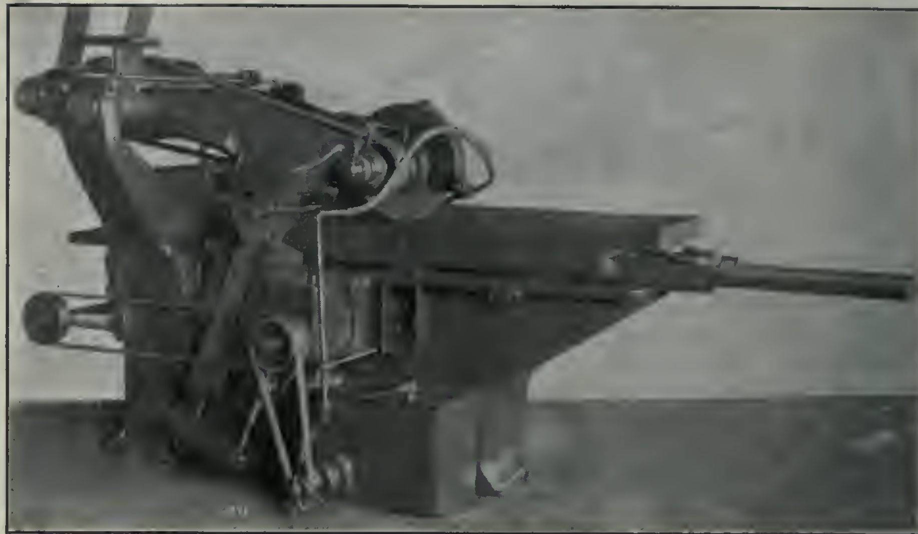
The new Pratt & Whitney Horizontal Grinder has demonstrated, during a series of most severe tests, that it produces work very accurately, and is also very rapid. The results obtained are largely due to extreme stability throughout, coupled with the use of a large, correctly supported and powerfully driven wheel, so designed that a liberal supply of water may be utilized during the grinding operation.

The bed is massively proportioned and internally braced in a manner to insure ample rigidity and permanent accuracy. It is very compact in design, the various units being located in a manner to be easily accessible. Wide bearing surfaces of the "V" and "Flat" type are provided. Oil reservoirs for the automatic oiling of the ways by means of rolls are located in the bed. The pan which surrounds the rear of the bed for collecting the water and receiving the chips is of liberal proportions, and is easily accessible for cleaning.

The table has been made amply heavy, and, furthermore, is powerfully ribbed in a manner to prevent warping and to resist torsional strains. It is provided with guards at each end, to cover and protect the bearing surfaces from injury. A spacious pan is cast integral with the table for controlling the water.

The table is provided with automatic reciprocating motion, any length of stroke up to four feet being readily obtainable by means of adjustable table dogs. The table feed mechanism is of substantial design. Two table feeds are provided, both of which are instantly controlled by means of a lever conveniently located at the front of the machine. This lever when adjusted to the central station also serves as a means for stopping the table. The table is driven through a rack and pinion vertically located.

The machine is provided with both hand and automatic horizontal feed. While both the table and horizontal wheel power feeds are engaged through the same trip, the feed units are entirely independent of one another. The feed mechanism operates a screw mounted within the hollow arbor upon which the arm is mounted. The screw engages a nut clamped firmly to the arm. Both the screw and the nut are of liberal proportions, and easily accessible. It will be observed that the feed mechanism is entirely enclosed, so that it is impossible for emery or dirt to injure it in any way. Any variations of feed are readily obtainable by means of a ratchet wheel and pawl. The feed is operative in either direction, it being governed merely by the direction in which the feed pawl is engaged. A safety is also provided, which prevents injury to the feed mechanism in case the arm should come into contact with the uprights, due to neglecting to disengage the feed mechanism.



4 FT. PRATT & WHITNEY HORIZONTAL SURFACE GRINDER.

4 FT. PRATT & WHITNEY HORIZONTAL SURFACE GRINDER.

The vertical wheel feed is through hand only, a large graduated dial being provided whereby it may be very accurately gauged. The semi-vertical ram by means of which the wheel is raised or lowered, is rigidly supported in long bearings. The construction is such that this ram is raised or lowered by means of a heavy screw and nut, the screw being driven through a worm and worm wheel, actuated by the hand wheel. On top of the ram a hardened and ground plate is mounted, which engages a similarly treated block on the under side of the arm.

A most important feature is the method of mounting the wheel in an arm, which entirely eliminates the slide construction. The arm has a perfect fit on an arbor, which is substantially supported upon two uprights. Both the arm and the arbor are proportioned so as to insure absolute strength and rigidity. With this construction the wheel is adequately supported without overhang.

The spindle is of tool steel, hardened, ground and lapped, special treatment and care being exercised to insure the highest possible efficiency of this important member. The boxes, made of bronze, are mounted in conical seats. Extra precautions have been taken to insure proper lubrication, large, self-feeding oilers being provided.

The wheel mount is self-contained and constructed so as to hold the wheels firmly and perfectly true. The spindle end has been made conical and provided with a key for the accommodation and positive driving of the wheel mount.

The machine is designed with a view to using wheels up to 18 inches diameter and 2 inch face. Suitable packing rings, however, are provided, which permit the use of wheels as thin as 1 inch face.

The wheel spindle drive is of liberal proportions throughout, so that there is no question but that the wheels will have sufficient power for any requirement. Two wheel speeds are provided by means of a two-grade cone, so that when the wheel is reduced by wear its speed may be increased. The mechanism for shifting the belt to obtain the increased speed of wheel is so designed that it also becomes necessary to proportionately decrease the table feed, consequently the table feed is always constant, regardless of whether the fast or slow wheel speed is being utilized. The wheel is driven from a drum which is finished perfectly true, so that there is no vibration to the machine.

A feature in these machines is the liberal and perfectly controlled water supply. It is well known that in order to keep the wheel free and prevent clogging, also to prevent the heating of the work, a liberal supply of water is absolutely necessary. The type of pump is made and located in a manner to entirely dispense with the usual idler pulleys. It is capable of supplying an abundance of water, ample to meet any requirement. An exceptionally large water tank is located on the back of the machine in an accessible position where it may be readily cleaned. It also permits the return of the water without it being carried through pipes.

PRENTICE SYSTEM OF WIRELESS TRAIN CONTROL.

WE had the opportunity, says "Engineering," through Mr. G. A. Phillips, of 4, Bishopsgate, E.C., of inspecting recently a demonstration installation of the Prentice automatic system of "wireless" train control, on the Hampton Court Branch of the London and South-Western Railway. In this system the track is divided into a number of insulated sections, in each of which a low-voltage track circuit is arranged, with, in addition, a high-tension wave wire running between the rails. At the end of each section is a box containing the high-frequency plant for the supply of current at 20,000 volts to the wave wire.

This plant is controlled by a relay in connection with the track circuit of the section ahead, with the result that if that track circuit be short circuited, the controlling relay is de-energised, and the supply of high-tension current to the wave wire ceases. The locomotive is fitted underneath with an arrangement of wires equivalent to the antennae of the ordinary wireless apparatus. These receive the energy transmitted from the wave wire, and by means of a system of coherers and relays in the cab, a green "line-clear" signal is provided for the driver if the section ahead is unoccupied. If, however, the section ahead be short circuited, the wave discharge and a red light is shown and a buzzer simultaneously sounded, while the brake is at the same time applied, these operations being effected by power obtained from a battery in the cab. Provision is made to enable the driver to release his brake, but the red light and the buzzer continue until the section ahead is cleared, when the high frequency supply is re-established and normal working is resumed.

The system, therefore, provides for a continuous danger signal on the locomotive so long as the line is not clear, the automatic application of the brake and a prompt intimation of the restoration of line clear conditions. In the event of failure of the high tension, or the track circuit, danger indications would be given. The operation of the cab apparatus naturally depends on uninterrupted battery supply. The demonstration was quite successful, the train being brought up on every trial by the automatically applied brake, although the regulator was untouched.

The system requires electrical supply to all the section-boxes, and transformer plant in each section-box, in addition to the boxed-in high-tension wire between the rails and the apparatus on the engine. The expense question is, therefore, one which will have to be seriously considered before the system is likely to be largely adopted. In addition to initial cost the working cost must also be taken into account, the power taken by a half-mile section being about 1 horse-power.

BRITISH FIRM SECURE U.S. CONTRACT.

A BRITISH builder, on September 11, was awarded the contract for turbine drums for the newest American battleship, No. 39, at a little more than one-third the price offered by the lowest American bidder. The accepted bid, $57,436, was submitted by New York agents of the Cyclops Steel & Iron Works, Sheffield, England.

It is exceptional for the Navy Department to send a contract abroad, but Acting-Secretary Roosevelt held that the action to-day was justified by the tremendous difference between the British and American prices. The Sheffield bid includes the payment of duty, and by giving the work to the foreign builder the United States saves more than $100,000.

There were two American bidders, the Bethlehem Steel Co., $169,568, and the Midvale Steel Co., $160,272. The Carnegie Co., the only other domestic concern equipped to build the drums, did not seek the contract.

METALS FOR STRUCTURES.

WHAT follows is a short abstract from a paper to be read this month by A. T. Walmsley, before the Engineering Section of the British Association for the Advancement of Science.

Alloys are not mere mechanical mixtures, but homogeneous combinations, secured by fusion, possessing distinguishing qualities for special purposes.

Copper possesses the element of conductivity. It is always economical to use the purest copper obtainable commercially, especially for electrical purposes.

Zinc is applied for coverings. Galvanised sheets can be tested with sulphate of copper, which will adhere to any exposed surface of the iron not coated with zinc. The durability of zinc depends mainly on the spelter from which it is made.

Lead has no elasticity, but is useful for girder seatings, where the weight is sufficient to crush the lead so as to produce uniformity of pressure upon the bearing. It is also serviceable for roof coverings and for flashings.

Brass, consisting of copper and zinc, is employed for lubricators and pumps, while Muntz's metal, also an alloy of copper and zinc, has superseded copper for sheathing vessels.

Manganese bronze, an alloy of copper and ferro-manganese, is serviceable for propeller blades, on account of its toughness; and ordinary bronze, an alloy of copper and tin, is found to possess sufficient fluidity for satisfactory melting, combined with slightness of contraction on solidifying.

Phosphor bronze, by the addition of phosphorus, excels ordinary bronze in hardness, density and tensile strength, and is used for friction bearings, especially when liable to shock; also for sliding surfaces in the case of steel shafts, as a steel or wrought iron shaft would grip a certain bearing.

Gunmetal, another alloy of copper and tin, takes its name from its employment as the metal from which large guns were formerly made, while bell-metal and delta-metal also possess characteristics described in the paper.

When one metal less oxidisable than another comes in contact, galvanic action may be set up. In the case of mild steel and wrought iron in metallic contact, the steel may oxidise at the expense of the iron.

TRADE AND COMMERCE RECORD

Dealing With the Steps Being Taken and Progress Made by Industrial Canada To Achieve and Maintain a Dominant Place in the Markets of the World

SOO CANALS TRAFFIC.

FOLLOWING is the statistical report of traffic passing through the canals at Sault Ste. Marie for the month of August:—

Eastbound.—Copper, short tons, 18,964; grain, bushels, 9,211,920; flour barrels, 1,437,364; iron ore, short tons, 7,461,384; pig iron, short tons, 2,414; lumber, million feet board measure, 105,166; wheat, bushels, 6,836,614; general merchandise, short tons, 57,958; passengers, number, 12,731.

Westbound.—Coal, hard, short tons, 383,847; coal, soft, short tons, 2,566,320; flour barrels, 400; manufactured iron, short tons, 37,193; iron ore, short tons, 9,136; salt barrels, 113,136; general merchandise, short tons, 212,770; passengers, number, 13,856.

Summary.—Vessel passages, number, 3,440; registered tonnage, net, 8,033,353; freight, eastbound, short tons, 8,263,273; freight, westbound, short tons, 3,226,169; total freight, short tons, 11,480,442.

Grain at Kingston.—So far this season, the Montreal Transportation Co's elevator at Kingston, Ont., has handled 7,248,010 bushels of grain, nearly two million bushels more than at the same time a year ago. The grain carrying trade has been very steady all summer. A busy fall is expected.

ONTARIO'S MINERAL OUTPUT.

ONTARIO'S mineral production for the first six months of this year shows a large increase. From returns made to the Bureau of Mines, the gain in metalliferous ores amounts to about three and three-quarter millions of dollars, the total being $18,598,804. Gold, of course, heads the list with a gain of $1,935,949, while silver shows a falling off of $242,887, and cobalt and nickel oxides of $5,726.

In addition to gold, there is an increase of $96,176 in copper, $347,519 in nickel, $108,264 in iron ore, and $1,109,202 in pig iron. These increases are all derived from comparison with the production for the same period in 1912. The detailed production is as follows:

	Quantity.	Value.
Gold, ounces ..	106,091	$2,171,147
Silver, „ ..	13,890,692	7,693,713
Copper, tons ..	5,873	832,645
Nickel, „ ..	12,104	2,514,414
Iron Ore, „ ..	62,627	141,324
Pig iron, „ ..	369,450	5,051,840
Cobalt ore, tons	79	7,374
Cobalt & nickel oxide, tons ..	404,060	186,347

Porcupine the Gold Centre.

Most of the gold, says the report handed out by Deputy Minister of Mines Gibson, came from Porcupine, the chief producers being the Hollinger and Dome Mines, both of which have been steadily at work. Porcupine Crown and McIntyre Porcupine also contributed. The other gold camps yielded about $150,000, including Swastika, Cordova in Hastings county, Canadian Exploration at Long Lake, Northern Gold Reefs at Sturgeon Lake, Goldfields, Limited, at Larder Lake, and Tough-Oakes at Kirkland Lake. The narrow veins in the last-named camp are proving to contain rich ore.

Greatest Silver Producers.

The most productive mines for the half year were the Nipissing, Coniagas, La Rose, Kerr Lake, McKinley-Darragh-Savage, Buffalo and Crown Reserve, all mines which have held a leading place for years. Cobalt Townsite, Casey,Cobalt, and Seneca Superior are coming into prominence as producers, while some properties, formerly in the first rank, are falling off in their yield.

Shipments of ore were 3,216 tons, of concentrates 8,253 tons, and of bullion produced at the mines 2,792,311 ounces. The corresponding figures for the first six months of 1912 were: Ore, 6,860 tons; concentrates, 4,806 tons; and bullion, 2,448,689 ounces, showing the progress being made towards complete treatment of the ore on the spot. Three mines in Gowganda and South Lorrain yielded 407,103 ounces.

Nickel and Copper.

The mines in the Sudbury district continue to increase their output. and the outlook is for still further production. The Canadian Copper Co. and the Mond Co. remain the sole producers of matte. Recent drilling operations have proven the existence of very large ore preserves. The Alexo mine, on the Porcupine branch of the T. & N. O. Railway, is interesting as being separated about one hundred and forty miles in a direct line from the Sudbury mines, and so proving the existence of ore quite outside the older field. The shipments are made to the Monde Co.'s new smelting plant at Coniston, which came into operation during the half year.

Pig Iron Production Grows.

The production of pig iron in Ontario is growing rapidly. In 1902 it amounted to 112,687 tons. In 1907 to 286,216 tons, in 1912 to 589,583 tons, and at the present rate of production if maintained for the remainder of the present year, the output will be 738,900 tons. All the blast furnaces except the one at Port Arthur were in blast during the six months.

GRAIN STORAGE RATES.

VARIOUS opinions have been expressed by shipping men with regard to the announcement that the Government had approved a by-law adopted by the Montreal Harbor Commissioners, increasing the rates to be charged for storing grain in the elevators of the port, including not only the Harbor Commission elevators, but the Grand Trunk elevator also. Some were of opinion that the increased charges would tend to discourage the speculative holding of grain; others that the probable effect would be to divert still more Canadian and Western American grain by way of Buffalo, instead of Montreal, a view that has been expressed before now by more than one prominent port official.

A view of the grain trade in general which was expressed is to the effect that however beneficial the grain trade and its transit by way of Montreal and the St. Lawrence may be to Canada, it is not of much benefit to Montreal as a port. In this connection it was pointed out that the handling of most kinds of merchandise exported results in about a dollar per ton being expended in the port, but that, in the case of grain, the benefit to the port is almost nil. Shipping men, however diverse the opinions they may hold, are all awaiting the result of the increased rates with considerable interest.

A NOTE OF PROSPERITY.

WITHIN a week or two the Canadian Furnace Co. will commence operations at its new plant, which has recently been completed in Port Colborne at a cost of about two million dollars, and an official opening will take place some time between September 20 and 30.

Such was the announcement of Mr. W. P. Fitzsimmons, general publicity agent of the Grand Trunk, who when interviewed recently, expressed surprise at the remarkable industrial growth throughout Canada. "The completion of this large plant and the commencement of operations," said Mr. Fitzsimmons, "is evidence in itself of growth and advancement in Canadian industry."

"It is a surprise to me," continued he, "inasmuch as I believed the so-called money stringency would handicap industry to no small extent, but only recently I have travelled from coast to coast, and everywhere I have been there is no sign of business being brought to a standstill."

"Other indications of growth and prosperity are numerous," stated Mr. Fitzsimmons. Additional tracks are being laid in Berlin by the Grand Trunk for the use of the Dominion Tire and Rubber Co. "This company will also carry on an extensive business, and will consequently send industry up another notch," continued he. "Then the Union Carbide Co. of Niagara Falls is extending its business by installing additional branches."

Motor Industry Grows.

"The automobile industry in and around Windsor is not only holding its own, but is making rapid strides, and this year's business will undoubtedly surpass that of any previous year.

"As far as the West is concerned, I am most optimistic, and I believe that is the feeling of the Westerners themselves." Visiting a large area of the West, Mr. Fitzsimmons is undoubtedly in a splendid position to size up conditions in general. He stated that everywhere he went crops were good. There is plenty of money, he stated, for legitimate business, and he felt that real estate would not go beyond bounds as it had done before.

G. T. P. COMPLETION.

PRESIDENT E. J. Chamberlain, of the G. T. P., who passed through Winnipeg after a trip of inspection over the western line, and to Prince Rupert, whence he inspected construction eastward from the coast, stated that it is now recognized as impossible to complete the line through the mountains to the coast by the end of 1914 as expected. Unforeseen difficulties, of which he did not give details, have delayed construction. Mr. Chamberlain did not make any statement as to when he expects the line to be completed.

DECLINED 3.8 PER CENT.

COMPLETE returns of Canadian railroad earnings for August bear out the predictions made recently that the month would show a decrease compared with 1912. The gross receipts of all roads reporting fell 3.8 per cent. below last year, that being the first instance in years that a decline had been registered.

It compared with a loss of 1.2 per cent. for the first three weeks of the month, an increase of 2.3 per cent. for the whole of July, 6.1 per cent. in June, 7.5 per cent. in May, 7.6 per cent. in April, 7.8 per cent. in March, 4 per cent. in February, and 20 per cent. in January.

The continued losses in the C. P. R. returns are responsible for the poor exhibit, for the other lines have had a steady increase.

OBJECT TO I.C.R. INCREASES.

MEMBERS of the Government have received copies of a very strongly worded protest by the Maritime Board of Trade against the increase in Intercolonial Railway freight rates. The argument advanced is that the construction of the road was incidental to the Confederation pact, and that, in view of the surrender by the provinces of the right of indirect taxation, it should not be operated with the idea of producing surpluses.

The resolution speaks of the lower provinces having given their blood and brawn, and concludes with a protest against the "insidious efforts" of Governments, Liberal and Conservative alike, to make the I.C.R. a surplus-producer.

CANADA AND THE WEST INDIES.

SOME very interesting statistics are contained in a booklet published by the Imperial Department of Agriculture, and distributed at the Toronto National Exhibition, regarding the trade between Canada and the West Indies. The Commissioner of Agriculture for the West Indies states that the value of Canadian imports into the British West Indies and British Guiana amounted in the year ending March 31, 1912, to \$4,617,961, while the value of the exports from the West Indies to Canada was \$10,550,491.

The total volume of the trade carried on between the two countries during that period was, therefore, \$15,168,452. In the year 1912, British Guiana exported to Canada produce, mostly sugar, to the value of \$3,472,531, while the imports of Canadian goods were worth \$583,536. From Barbadoes, in 1912, sugar to the value of \$1,256,261, and molasses to the value of \$1,264,651 were sent to Canada, and imports of the value of \$882,240 received.

The value of the imports from Canada into Jamaica in 1911 was \$1,169,143, or 8.5 per cent. of the total imports, and the value of the exports to Canada from Jamaica was 8.6 per cent. of the total exports, as compared with 8.4 in 1910, and 4.7 in 1909.

Trinidad in 1911 sent exports to the value of \$989,438 to British North America, and received imports of the value of \$913,378. These figures show that a very considerable trade has already been established.

UNTREATED POLES.

MUCH attention has been drawn lately in Canada to the heavy loss sustained annually by the use of telephone and telegraph poles untreated with creosote or any other preservative. The number of new poles required in Canada to replace decayed poles is stated to be about 600,000 per annum. Practically all of these are now put up untreated. The estimated life of poles of Western red cedar, untreated, is ten years; brush treated with creosote, thirteen years; and tank-dipped, twenty years. With Northern white cedar, the periods are fourteen years, seventeen years, and twenty-two years respectively; and with Western yellow pine, three, five, and twenty years.

It has been computed that if all the poles used in Canada for telegraph and telephone work were treated with creosote, a saving of upwards of 260,000 poles per year would be effected. The practice of tank-dipping new poles will, it is believed, be adopted generally in Canada, now that the advantage of so doing has been demonstrated.

GRAIN BLOCKADE AT MONTREAL.

THAT the grain blockade, which is said to have occurred at Montreal, will have no effect on the movement of the western grain crops, more than to cause a great deal of it to be shipped by way of American ports instead of Canadian ports, is the statement made by W. B. Lanigan, assistant freight traffic manager of the C.P.R.

Mr. Lanigan points out that, with a blockade at Montreal, it would be impossible to ship large quantities of grain there from Fort William, because it could not be taken care of. Therefore, most of it will be sent down to New York by way of Buffalo and other American routes.

Speaking of the movement of the western crop which has already commenced, Mr. Lanigan stated that since September 1, no less than 633 carloads of grain had been loaded on C.P.R. lines. Mr. Lanigan drew attention to the fact that the movement has started in fairly heavily.

RESTRICTIVE CONTRACT CASE.

AN interesting case of restrictive contract is being presented in the Montreal civil courts. John Berry was at one time employed by the Canada Metal Co. of Toronto, having a contract with them which stipulated that he should not, in the event of his leaving their service, enter the service of any other firm in the same capacity within the period of a year. Berry left the Canada Metal Co. and went to Montreal, where he signed with Cuthbert & Son.

The former seek an injunction to prevent Berry from working with the latter firm, claiming that as he knows many of their secret processes, the breaking of his contract means a serious loss to them. It is questioned whether the contract is legal, since it binds a man not to engage in the only trade by which he can make his living. A somewhat similar case occurred a year ago—that of a hockey player who left the Nationals and joined the Wanderers.

CANADIAN FREIGHT RATES.

W. BLACK NOBLE, writing to the "London Times" on the subject of Canadian freight rates, and with particular reference to the mission of H. L. Drayton, Chairman of the Dominion Railway Board, who has met him, expresses the opinion that the Canadian Government would be adopting a sounder policy if, instead of advocating State control of ocean rates, they would consider the question in a more general sense apart from the Canadian millers.

Flour Rate Excessive.

The contention is that the rate on flour is excessive as compared with grain, and that the existing preferential tariff is practically neutralized by the exorbitant rates on westbound goods. He describes it as incredible that any body of right thinking men could entertain such proposals as are being put forward, namely:

1—That ocean carriers should be treated as, and if necessary legislated into, the position of common carriers.

2—That the Canadian Government should form a fleet of vessels of their own for the conveyance of eastbound produce and westbound merchandise.

3—That powers under the three-mile limit of territorial jurisdiction should be exercised in connection with steamers trading to Canadian points.

It would be much better, concludes Mr. Noble, if instead of spending money in establishing a State Department, a very dilatory and inefficient method of attaining their object, they employed money in forming a fund for subsidizing merchants who were unable to carry on profitably a business which is necessary to the well-being and prosperity of the country.

Means Trade Restriction.

By dealing with the situation in any other manner, the inevitable result would be the restriction of export and import facilities, an eventuality which for a growing country like Canada, ought not to receive the most passing consideration on the part of those entrusted with the management of her business.

MONTREAL HARBOR BOARD AND GRAIN TRADE.

VARIOUS tables of statistics having been quoted in support of the contention that the Harbor Commissioners of Montreal should provide more storage facilities at that port for grain, tables which differ almost as widely from each other as from the facts, the suggestion has been made that the official figures of grain trade for the port should be republished.

In 1898, the export trade of the port in grain was over 40,000,000 bushels for the year. From that date grain exports steadily declined until, in 1905, the official return showed that the volume of business done was only 13,455,413 bushels. From 1905 there has been an increase, until last year the figures nearly rose to those attained during 1898. The details for each year of the increase are as follows:—

1906	28,812,607
1907	32,783,018
1908	31,421,082
1909	27,959,395
1910	26,859,268
1911	29,893,184
1912	38,918,264

From the above figures it will be seen that the increase since the lean year of 1905 has been irregular and fluctuating; but the indications are that the figures for the present year will top those of 1898, a fact which lends point to the contention of grain exporters that further storage facilities should be provided. Their demand is being considered by the Harbor Commissioners, who have consulted the exporters as to the site of a new elevator, whenever its erection shall have been decided upon. The Harbor Board will likely arrive at a decision shortly, and the announcement of that decision may be made soon afterwards.

C. G. E. ACQUIRE STRATFORD MILL BUILDING CO.

SOME time ago the Canadian General Electric Co. acquired by agreement with the Allis-Chalmers Co. of the United States, the right to manufacture and sell exclusively in Canada their various lines of manufacture. The Canadian General Electric Co., at their various works, have sufficient equipment for manufacturing most of the apparatus for which these rights were acquired, such as hydraulic machinery, saw mill machinery, mining machinery, etc., but had no equipment for the manufacture of flour mill machinery, grain elevator equipment, etc., such as manufactured by the Allis-Chalmers Co., and in order to be fully equipped to take care of all business offering in this line, the Canadian General Electric Co. have just acquired by purchase all the plant and assets of the Stratford Mill Building Co., at which plant, in future, will be manufactured not only the well-known lines of flour mill machinery heretofore manufactured by the Stratford Mill Building Co., but also the wider range of machinery and equipment as produced by the Allis-Chalmers Co.

Mr. William Preston, who has been the President of the Stratford Mill Building Co., will continue actively identified with the flour mill machinery business as manager of the flour mill machinery department of the Canadian Allis-Chalmers Co.

STEEL CO. OF CANADA AT FORT-WILLIAM. N

G. O. CALLAGHAN, managing director of the Steel Co. of Canada, while in Fort William recently, inspecting the big plant of this company now under construction, stated that, under ordinary favorable conditions, the Fort William plant would be ready to begin operations on April 1, 1914.

Prack & Perrine, Hamilton, the contractors in charge of the building operations, have a large staff of men at work, and will be putting on a larger staff in a short time to make even better headway than has been made. It is intended to have the building closed in before real winter sets in, so that there will be no delay in the construction work until the completed structure is turned over to the owners.

LEAD ALLOY FOR TAPES.

THE Western Electric Co. has patented the following alloy in England. It is intended for use in the form of tape for winding electrical conductors:

Lead	95.00%
Antimony	4.50%
Tin	.50%

It is stated that the tape made from this alloy is more economical than pure lead, for the reason that the thickness may be reduced one-half, the width increased by one-third and the same strength obtained.

Ottawa, Ont.—A new bridge will be built over the Rideau River, east of Billings' bridge.

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Vol. X. SEPTEMBER 18, 1913 No. 12

PRINCIPAL CONTENTS.

FREE SUPPLIES TO STUDENTS.

A RECENT decision of the Advisory Industrial Committee of the Board of Education makes free, to all pupils in the first year industrial course at the Toronto Technical School, books, drawing instruments, science supplies and lockers. Despite a strong protest on the part of one member of the committee, the proposal, which originated with the principal, got the necessary support for its enactment.

To our mind the step is a retrograde one, and gives abundant evidence of the lack of appreciation of human nature as found in our industrial workers, or for that matter, among any body of civilized people, on the part of those who supported the proposal. The principal's plea that, by adopting the scheme, classes unfilled would receive the necessary complement, has no foundation in fact or experience, and he forgets that while it looks well to see a report in the public press that no more students can be enrolled, his business and the purpose of the school is not to pack or herd human beings together, but to teach and train them.

The decision anent the already mentioned equipment is nothing more or less than cheap philanthropy, yes, gallery play, and were its results no more hurtful or impressive than these, the affair would not be worth even passing notice. There is, however, a serious side to the matter, the pauperizing feature, and beyond that again is the certain tendency to indifference to any instruction given, because of there being nothing really tangible at stake on the part of the individual. If a student pay his fees and buy his equipment, he does so with some determined purpose in view, and although many, even under these conditions, fall away later from their ideal, there is more hope of a larger percentage making good than under a regime where something is bartered for nothing.

We all sympathize with the student who is apparently barred from participating in the benefits and privileges of the technical school because he lacks the seven dollars, but we do him more injustice still if we make him a pauper. The lad who is in earnest about his education, or about anything, as a matter of fact, will get there, if left to himself, and while he may not get there just when he wants, he will be none the worse but a whole lot the better for it, as it will have put some real manhood into him. None of us get what we want, nor when we want it, and in taking ourselves to task on the subject we must all admit that we are better as a consequence. Bribing a boy with supplies will, in no shape or form, educate, and if education is worth anything to-day, and if those who are responsible for its imparting knew their business, then a higher standard of manhood should be the goal.

Another aspect of the technical education question is that exemplified by teachers giving their services gratuitously. More philanthropy, you say. Yes, and equally futile. In this twentieth century we had believed that the veriest child realized that there was no such a condition in our economy as something for nothing, yet, here in Toronto Technical School there have been teachers giving their services free, with the result that the management has become dissatisfied. We have all got to be bound down to our task, and a reward for the latter takes away most of the irksomeness involved, but where philanthropy reigns, the loosening of the binding feature proves the only reward, and the performance suffers. This wholesale disregard of the real place and function of our technical school is, to say the least, appalling, and occasions no surprise among those who know the circumstances under which our youth are being trained and educated, not only to take their own place in the march of progress, but to bring our country, at least, on a competitive level with other industrial nations.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

	Mont'l.	Tor'to.
Grey Forge, Pittsburg.	.....	14 25
Lake Superior, charcoal, Chicago	.....	14 50
Middlesboro, No. 3	20 00	21 50
Carron, special	22 50	.....
Carron, soft	22 50	.....
Cleveland, No. 3	20 00	22 00
Clarence, No. 3	20 00	21 00
Jarrow	.....	23 50
Glengarnock	.....	26 00
Michigan charcoal iron	27 00	.....
Ferro Nickel pig iron (Soo)	.....	25 00
Staveley, No. 1	20 00	22 50
„ No. 3	20 00	22 00

BILLETS.

	Per Gross Ton.
Bessemer billets, Pittsburgh	$27 00
Open hearth billets, Pittsburgh.	27 00
Forging billets, Pittsburgh	34 00
Wire rods, Pittsburgh	28 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto	2.10
Steel bars, f.o.b., Toronto	2.15
Common bar iron, f.o.b., Montreal.	2.15
Steel bars, f.o.b., Montreal	2.25
Bessemer rails, heavy, at mill	1.25
Steel bars, Pittsburgh, future	1.40
Tank plates, Pittsburgh, future	1.45
Beams, Pittsburgh, future	1.45
Angles, Pittsburgh, future	1.45
Steel hoops, Pittsburgh	1.50

F.O.B., Toronto Warehouse.	Cents.
Steel bars	2.30
Small shapes	2.40

Warehouse, Freight and Duty to Pay.	Cents.
Steel bars	1.85
Structural shapes	1.95
Plates	1.95

Freight, Pittsburgh to Toronto.

18 cents carload; 21 cents less carload.

IRON PIPE FITTINGS.

Canadian malleable, 40 per cent.; cast iron, 65; standard bushings, 70; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 75; malleable, lipped unions, 65.

BOILER PLATES.

	Mont'l.	Tor'to.
Plates, ¼ to ½ in., 100 lbs.	$2.35	$2.30
Heads, per 100 lbs.	2.65	2.65
Tank plates, 3-16 in.	2.60	2.55
Tubes, per 100 ft., 1 inch	9.50	8.50
" " 1¼ in.	9.50	8.50
" " 1½ "	9.50	9.00
" " 1¾ "	9.50	9.00
" " 2 "	8.75	8.75
" " 2½ "	11.15	11.50
" " 3 "	12.10	12.00
" " 3½ "	14.15	14.50
" " 4 "	18.00	18.00

BOLTS. NUTS AND SCREWS.

	Per Cent.
Stove bolts	80 & 7½
Machine bolts, ⅜ and less	65 & 5
Machine bolts, 7-16	57½
Blank bolts	57½
Bolt ends	57½
Machine screws, iron, brass	35 p c.
Nuts, square, all sizes	4c per lb off
Nuts, Hexagon, all sizes	4¼ per lb off
Fillister head	25 per cent.
Iron rivets	60, 10 p c off
Wood screws, flathead, bright	85, 10, 7½ p c off
Wood screws, flathead, brass	75, 10, 7½ p c off
Wood screws, flathead bronze	70, 10, 7½ p c off

National-Acme "Milled Products."

Sq. & Hex Head Cap Screws	65 & 10%
Sq. & Hex Head Cap Screws	65 & 10%
Rd. & Fil. Head Cap Screws	45-10-10%
Flat & But. Head Cap Screws	40-10-10%
Finished Nuts up to 1 in.	75%
Finished Nuts over 1 in.	72%
Semi-Fin. Nuts, up to 1 in.	75%
Semi-Fin. Nuts over 1 in.	72%
Studs	65%

Discounts f.o.b., Montreal.

FINE STEEL WIRE.

Discount 25 per cent. List of extras. In 100-lb. lots: No. 17, $5; No. 18, $5.50; No. 19, $6; No. 20, $6.65; No. 21. $7; No. 22, $7.30; No. 23, $7.65; No. 24. $8; No. 25, $9; No. 26, $9.50; No. 27, $10; No. 28, $11; No. 29, $12; No. 30, $13; No. 31, $14; No. 32, $15; No. 33, $16; No. 34, $17. Extras net. Tinned wire, Nos. 17-25, $2; Nos. 26-31, $4; Nos. 30-34, $6. Coppered, 75c; oiling 10c.

WROUGHT IRON PIPE.

The following are Toronto jobbers' discounts on pipe in effect from April 21, 1913:

	Buttweld		Lapweld	
Standard	Black	Gal.	Black	Gal.
¼ ⅜ in.	62	47	....	....
½ in.	68	58	....	....
¾ to 1½	71½	61½	68½	58½
2 in.	71½	61½	68½	58½
2½ to 4 in.	71½	61½	70½	60½
4½ to 6 in.	....	....	71½	61½
7, 8, 10 in.	....	....	66	54
X Strong P. E.				
¼, ⅜, ½in.	56½	46½	....	....
¾ to 1½ in.	67½	57½	....	....
2 to 3 in.	68½	58½	....	....
2½ to 4 in.	....	....	65	55
4½ to 6 in.	....	....	64	56
7 to 8 in.	....	....	55	45
XX Strong P. E.				
½ to 2 in.	43	33	....	....
2½ to 4 in.	....	....	43	33

PRICES OF WROUGHT IRON PIPE.

Standard.		Extra Strong.		D. Ex. Strong.	
Nom. Diam.	Price. per ft.	Sizes Ins.	Price per ft.	Size Ins.	Price per ft.
⅛in	$ .05½	⅛in	$ .12	½	$ .32
¼in	.06	¼in	.07½	¾	.35
⅜in	.06	⅜in	.07½	1	.37
½in	.08½	½in	.11	1¼	.52½
¾in	.11½	¾in	.15	1½	.65
1 in	.17½	1 in	.22	2	.91
1¼in	.23½	1¼in	.30	2½	1.37
1½in	.27½	1½in	.36½	3	1.86
2 in	.37	2 in	.50½	3½	2.30
2½in	.58½	2½in	.77	4	2.76
3 in	.76½	3 in	1.03	4½	3.26
3½in	.92	3½in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4½in	1.27	4½in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.86	...	.....
7 in	2.38	7 in	3.81	...	.....
8 in	2.50	8 in	4.34	...	.....
8 in	2.88	9 in	4.90	...	.....
9 in	3.45	10 in	5.48	...	.....
10 in	3.20	....	....	...	.....
10 in	3.50	....	....	...	.....
10 in	4.12	....	....	...	.....

NAILS AND SPIKES.

Standard steel wire nails, base		$2 40
Cut nails	$2 60	2 65
Miscellaneous wire nails		75 per cent.
Pressed spikes, ⅝ diam., 100 lbs.		2 85

OLD MATERIAL.

Dealers' Buying Prices.	Mont'l.	Tor'to.
Copper, light	$10 50	$11 50
Copper, crucible	12 50	14 50
Copper, uncr'bled, heavy	12 00	12 50
Copper wire, uncrc'bled	12 00	12 50
No. 1 machine compos'n	10 50	12 50
No. 1 comps'n turnings	9 50	9 50
No. 1 wrought iron	10 00	9 00
Heavy melting steel	9.50	10.00
No. 1 machinery cast iron	13 00	14 00
New brass clippings	8 50	9 00
No. 1 brass turnings	7 25	8 00
Heavy lead	3 50	4.25
Tea lead	2 75	3.20
Scrap zinc	3 00	3 50

COKE AND COAL.

Solvay Foundry Coke	5.95
Connellsville Foundry Coke	5.45
Yough, Steam Lump Coal	3.93
Penn. Steam Lump Coal	3.63
Best Slack	2.95

All net ton f.o.b. Toronto.

METALS.

	Mont'l.	Tor'to.
Lake copper	$17.00	$16.25
Electrolytic copper	17.00	16.25
Casting copper	17.00	16.00
Spelter	5.50	5.75
Lead	5.50	5.00
Tin	44.50	43.00
Antimony	8.50	9.00
Aluminum	22.00	18.00

MISCELLANEOUS.

	Cents
Putty, 100 lb drums	$2.70
Red dry lead, 5 cwt. casks, per cwt.	6.00
Glue, French medal, per lb	0.10
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.26
Benzine, per gal.	23½
Pure turpentine	0.60
Linseed oil, raw	0.60
Linseed oil, boiled	0.63
Plaster of Paris, per bbl.	2.10
Plumbers' Oakum, per 100 lbs.	3.25
Pure Manila rope	17

SMOOTH STEEL WIRE.

No. 6-9 gauge, $2.25 base; No. 10 gauge, 6c extra; No. 11 gauge, 12 extra; No. 12 gauge, 20c extra; No. 13 gauge, 30c extra; No. 14 gauge, 40c extra; No. 15 gauge, 55c extra; No. 16 gauge, 70c extra. Add 60c for coppering and $2 for tinning.

Extra net per 100 lb.—Spring wire; bright soft drawn, 15c; charcoal (extra quality), $1.25.

SHEETS.

	Mont'l.	Tor'to.
Sheets, black, No. 28	$2.85	2.90
Canada plates, ordinary, 52 sheets	3.10	3 00
Canada plates, all bright	4 00	4 15
Apollo brand, 10¾ oz. (American)	4 30	4 20
Queen's Head, 28 B.W.G.	4 40	4 40
Fleur-de-Lis, 28 B.W.G.	4 20	4 25
Gorbal's Best Best, No. 28	4 40	4 40
Viking metal, No. 28	4 40	4 40

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents.

Montreal, September 15, 1913.—The machinery trade reports a fairly satisfactory week, and most houses state that up-to-date the volume of business transacted is considerably in advance of the corresponding period in 1912; in fact, one large firm have already passed the total for the whole of last year. No particularly large orders were placed last week. The Canadian Pacific Railway Co. purchased a small amount of roundhouse equipment, but apart from that there is little to record. However, some encouraging inquiries were received, and these may lead to some good orders later. At present interest centres on the equipment for the Atlantic Sugar Refineries' plant at St. John, N.B. The tenders have been sent in, and the placing of the orders is being anxiously awaited.

Pig Iron, Copper, etc.

There is a brisk movement in English pig iron at present, purchasers buying freely in view of present low prices. Many are now beginning to lay in winter stocks before the close of navigation, now only some ten weeks' distant. Prices remain firm at last week's figures. No further developments have as yet taken place in the affairs of the Canada Iron Corporation, nor are any expected for some little time.

Copper had a slight reaction in the middle of last week, but has now returned to its former price. While labor conditions in the Lake district are said to be much quieter now than they were a short time ago, production is still very much below normal, and if consumption continues to increase at its recent rapid rate, the price is likely to rise considerably higher than it is at present. Some alarmists even prophesy 20 cent copper in New York before the close of the year.

Tin remains unchanged, with very little business offering. Lead shows a tendency to become firmer. Supplies for immediate delivery are scarce.

Toronto, Sept. 16, 1913.—The market for machine tools is distinctly better this week. Messrs. A. R. Williams & Co. claim to have received more enquiries during the past week than for a month, and other dealers are equally optimistic. Principal enquiries are from The Arnold Co., 105 Lasalle Street, Chicago, who are buying a large lathe, drill, shaper and a pipe machine for the Algoma Central and Hudson Bay Railway. The Arnold Co. secured the contract from this firm on a previous occasion for about fifty machine tools. The Department of Works of the City of Toronto are buying a shaper, drill, lathe, screw cutting gears, emery wheel stand, etc. The contract for about $10,000 worth of machine tools for the Abitibi Pulp and Paper Co., of Iroquois Falls, Ont., was divided between Williams and Wilson, of Montreal, and the A. R. Williams Co., of Toronto. The John Inglis Co., engine makers, Toronto, who are extending their plant, are in the market for seven or eight large machine tools. Henry Hope & Sons, of Peterborough, Ont., the English firm who are building a plant in Canada for the manufacture of steel sashes, are also buying a large number of tools.

Pig Iron and Steel.

There are dealers in Toronto fully convinced that the steel business in Canada will not revive until spring. On the other hand, there are some who expect a revival before Christmas. People with stricter credit are getting business now which was lost by them to those with looser credit some months ago. Import business is still light, business being done mainly in lighter stuff, such as boiler tubes, which are in great demand at this time of the year for winter repairs. It is stated on good authority that a reduction in mill prices may be expected very soon, owing to severe competition. Considerable warehouse business is being done in galvanized sheets. Stove and agricultural men are not buying as readily as was expected. Business on the whole, however, is not nearly as bad as it was this time in 1907. As for building, opinions vary again. Some people think it will fall off considerably, while others think it will be heavy. It is significant that concerns with plenty of capital are planning extensions to their premises on the theory that if this is to be a bad winter, it will be a good opportunity to prepare for the good times ahead. No changes in price have taken place. Messrs. Drummond McCall & Co. are off the market for pig iron. In the supply business considerable heating and steam goods are being bought, and pipe is in great demand. The record of a large supply house's sales during the past week shows the above lines to predominate.

Metals.

Business is quiet, but the market is steady. Several local firms report a fairly good week, chiefly in copper, most of which was for casting. The only change of any significance is in tin, which rose a cent a pound. Under the heading of old material, No. 1 composition turnings are up a cent. No. 1 wt. iron is also a cent dearer, and heavy lead brings 25 cents a cwt. more.

INCREASE GRAIN STORAGE NEXT YEAR.

A STATEMENT has been given out at the offices of the Montreal Harbor Commissioners to the effect that the Commissioners, after carefully considering the representations made by the deputation of grain exporters who waited on them and others, recently, had decided that the grain storage facilities of the port would have to be increased; but a commencement will not be made with the work before next spring, at the earliest. As to whether the programme of extension will include the erection of a new elevator is not yet certain, but, in any case, further additions will be made to the existing elevators controlled by the Harbor Commission.

STRONG SOLUTIONS FOR ELECTRO-GALVANISING.

THE zinc salt employed almost exclusively for electro-galvanising is the sulphate. This is the cheapest of any salt that can be used for the purpose. The only other modification employed for the electro-deposition of zinc is a cyanide solution which is now and then used, although rarely, in instances where the sulphate cannot be employed.

Zinc sulphate occurs in commerce in the form of fine, white-needle-shaped crystals. These crystals contain 43.90 per cent. of water in the form of "water of crystallisation." When standing in the air, the water is gradually given off, and dry sulphate of zinc remains. The dry sulphate of zinc, therefore, contains a far greater amount of zinc than the crystallized salt, for the reason that its water is being lost, which, of course, increases the zinc percentage. The amount of zinc in the crystallized and dry salts is as follows:—

	Per cent.
Crystallized zinc sulphate	22.64
Dry zinc sulphate	40.37

It has been found that the best results are obtained if a solution of zinc sulphate used for electro-galvanizing is well concentrated. It then "throws" better, and the zinc deposits more rapidly with a given voltage on account of the increased conductivity.

GRAIN STORAGE RATES UP.

THE promised jump in rates for grain storage in Montreal elevators is announced to take effect October first, much to the satisfaction of inland speculators and grain handlers, who believe that, under the increased tax, the Harbor Commission will be able to maintain the elevators for transfer purposes, as they were originally intended.

The Cabinet Council of the Government has approved the resolution adopted by the Commission recommending an increase for storage after twenty days. The new rate will be three-tenths of a cent per bushel. At the Grand Trunk elevator, a similar rate will be enforced, and the free storage decreased from thirty days to twenty. The toll for elevating grain from lake or rail carriers is to undergo a like increase.

ELEVATOR CONTRACTS LET.

THE Barnett McQueen Co., Ltd., Winnipeg and Fort William, have been awarded the contracts for the internal storage elevators to be erected at Saskatoon and Fort William. Each of the elevators will cost almost one million dollars, and the Barnett McQueen Co. was the lowest of the four tenders received. They have just completed the erection of the Government terminal elevator at Port Arthur and the work has met with the approval of the Grain Commission.

Contracts call for the completion of the elevators by December 15, 1914, so as to be in time to assist in storing the crop next year. As they each have a capacity of three and a half million bushels, this will greatly add to the storage capacity.

Fireproof Steel Cars. — In testing a steel car with a view to proving its fireproof qualities, the Pennsylvania Company placed in the car 200 lb. of shavings and wood saturated with oil, set fire to it, and allowed the mass to burn itself out. The paint and upholstery were destroyed, but no damage was done to the car as a whole. At present 2,872 steel passenger cars are in service on the Pennsylvania system, and this is about one-half of the total of steel passenger cars in service in the United States.

POVERTY NO BARRIER.

LACK of means need no longer prevent any boy from taking the first year industrial course, according to Dr. A. C. McKay, principal of the Toronto Technical School. On Dr. McKay's recommendation, the Advisory Industrial Committee of the Board of Education have decided that books, drawing instruments, science supplies and lockers should be provided free to all pupils in the first year of the industrial courses.

In recommending the change, Dr. McKay pointed out that, under present conditions, a pupil entering the course had to pay about $7 for supplies, and he declared he knew personally of many cases where the knowledge that this outlay had to be made had deterred many boys from taking the courses. He added:—

"Under the recent amendment to the Education Act, a public school pupil with fourth book standing is entitled to free tuition in the industrial courses at the Technical. This is a very fine thing, but at present there are a great many boys who, through lack of means, are unable to take advantage of the special opportunity offered to fit themselves for industrial life.

Would Fill Classes.

"Our classes now are very well attended, but we could accommodate, say, fifty more pupils, and if you carry out my suggestion it will probably go a long way toward filling the classes.

Trustee Dr. Noble called attention to the fact that the existing regulations gave the Board the power to supply books free to pupils who could not afford to pay for them. To this Dr. McKay replied that he would be unwilling to label any boy as being not so well-to-do as his fellows.

Better Have Their Own.

"Nevertheless," persisted Dr. Noble, "I think it much better that every boy should possess his own books. He is less likely to destroy them, and it may induce him to lay the foundations for a personal library. Besides, if the books are to be kept in the schools the boys will have no opportunity, as they should have, to read them at home."

The Principal assured him that the boys would be allowed to take the books home. The instruments, however, would be kept at the school.

Still unwilling to admit defeat, Dr. Noble prophesied that the Medical Officer of Health would step in and refuse to countenance the circulation of books from one set of boys to another. His gloomy prognostication, however, fell on unheeding ears, and Dr. McKay's recommendation was endorsed.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Engineering

Parry Sound, Ont.—A furnace has just been started here for making pig iron.

Brantford, Ont.—The Brantford Machine and Foundry Co., Ltd., are looking for a site at Echo Place, near here.

Fort William, Ont.—The engines in the Canada Iron Corporation power house were damaged by fire on Sept. 9.

Toronto, Ont.—$6,000 damage was done by fire on Monday to the pattern shop of the Berg Machinery Co., on Bathurst Street.

Hull, Que.—Plans have been prepared for the new $50,000 foundry of A. H. Coplan, of Ottawa, and work will commence at once.

Oakville, Ont.—The council are negotiating with a stove manufacturing concern for the erection of a foundry here, to employ 50 to 60 hands.

Victoria, B.C.—The Warren Construction Co., who have received a contract for making 23 miles of road through Saanich, B.C., are buying equipment.

Ottawa, Ont.—A plant for the manufacture of mining tools and equipment is planned in Ottawa by M. J. O'Brien, of Renfrew. Plans are now in progress.

Bredenbury, Sask.—The C. P. R. are adding a machine shop to their roundhouse equipment, and are installing a stationary engine, lathe, planer and grinders.

Regina, Sask.—The Brand Stove Co., of Milwaukee, Wis., are about to build a foundry. A. L. Gordon, of Allan, Gordon, Bryant & Gordon, is representing the firm here.

Almonte, Ont.—Persons interested in a new stove works here are applying for incorporation. A building has been rented, and operations should commence towards the first of the year.

Toronto, Ont.—Geo. Gale & Sons, brass bed manufacturers, of Montreal, will build a branch factory on Logan Ave., where a site has been purchased for $30,000, measuring 200 x 298 ft.

Medicine Hat, Alta.—The Western Canada Threshing Machine Co., Medicine Hat, Alberta, is negotiating for the erection of a large plant for the manufacture of farm implements. J. E. Davies, Medicine Hat, is president.

Windsor, Ont.—The Burroughs Adding Machine Co. announce that they do not contemplate extensive manufacturing in Canada yet, and will devote their attention to filling orders without a big investment in tools and machinery. If the advantage of a Canadian branch justifies, a new plant may be built.

Sault Ste. Marie., Ont.—On the result of the Government tests to be made here in the course of a few days of the new Michaelsen concentrating machinery hang the chances of a new industry for this city which will employ 600 hands. C. O. Michaelsen, the inventor, claims that his machines will save such a large percentage of metal that the milling of low grade ores will become very remunerative. The Government will conduct the tests on copper sulphides and gold-bearing ores.

Kingston, Ont.—A plant for the manufacture of iron and steel pipe and tubing will locate here on certain conditions. The company will spend $160,000 on buildings and machinery, and employ 150 men. There will be six buildings, measuring as follows:—160 x 75, 160 x 80, 75 x 55, 60 x 50, and 40 x 25. The company's name will probably be the Kingston Iron & Tube Co. They ask the city for important concessions. Ald. Hoag is chairman of the Industries' Committee.

Electrical

Granium, Alta.—$1,000 will be raised to establish a lighting system for the streets.

Peterborough, Ont.—The Hydro-Electric Commission are rushing their construction work here.

Lachine, Que.—The Lachine Council have ordered plans to be prepared for a power house extension.

Peterborough, Ont., has been asked by the Ontario Hydro-Electric Commission to appoint an electric wiring inspector.

Winnipeg and St. Boniface are quarreling over the decision of the former to sell power and light within the confines of the latter municipality.

St. Catharines, Ont.—The cost of a Hydro-electric plant in St. Catharines is estimated by the Commission at $90,000, and $26,000 for a street lighting system.

Regina, Sask.—A start has been made to build the new power house. It will not be completed before next year. The old power house will later be used as a pumping plant.

Owen Sound, Ont.—J. Hogg, consulting engineer, says that 1,600 h.p. may be generated at Eugenia Falls in the summer, and 4,000 in winter. Development work will begin at once.

Souris, Man.—At a meeting of the town council on Sept. 3 it was decided to call tenders for an electric light plant. It is expected the system will be in operation before Christmas. A 24 hour light and power service will be furnished from the start.

Nelson, B.C.—The West Kootenay Power & Light Co. has made arrangements to increase the capacity of its power plant at Bonnington Falls, and the necessary machinery is being ordered. Nine thousand horse-power is being added to the plant.

Nelson, B.C.—The C.P.R. will use electric locomotives costing $75,000 each on its Castlegar to Rossland line. Though construction work has not yet actually started on the electrification of the line, preliminary arrangements are being made, and work will be commenced in a short time.

Sault Ste. Marie, Ont.—A contract was signed to-day whereby the Soo Dredging & Construction Company was given the work of deepening the power canal of the Lake Superior Power Co. here. The estimated cost of the work is $300,000. Several thousand horse-power will be used for manufacturing purposes.

Walkerton, Ont—The Walkerton Electric Light & Power Co. have dammed the Saugeen River and built a power house. The dam is 420 feet long, and is built of cement. The race is half a mile long, of which some 510 feet are of cement, making in all about 930 feet of solid cement work. The power-house, also of cement, is 40 feet by 50 feet, and the front of the apron is protected by interlocking steel piling 22 feet deep. The head gates are quadruple. The equipment is of the latest Swedish and German type to be obtained in Canada. The capacity of the dam at low water is about 600 h.p. The machinery installed in the power-house is capable of generating about 300 h.p., but an extra bulkhead has been constructed to accommodate a second wheel, and so double the capacity. Power is offered at the low rate of $25 per h.p.

Municipal

Alsask, Sask.—The town will purchase a fire engine, with necessary appliances, costing $6,000.

Prince Albert, Sask.—A by-law for the raising of $275,000 for the erection of a new steam power house and plant was passed by the ratepayers.

Wolseley, Sask.—The by-law to raise $14,000 for the purchase of the plant of the Central Light and Power Company of this town was passed by the ratepayers.

Calgary, Alta.—The following by-laws will be placed before the burgesses for ratification on Sept. 27: To raise $52,000 for fire department; $45,100 for parks and cemeteries; $350,000 for the establishment of Union Stock Yards, abattoirs, warehouses, and manufactories thereon; $468,900 for the constructing of level bridge across Bow River; $173,000 for concrete bridge across Bow River; $319,350 for concrete bridge across Bow River; $82,100 re steel bridge for Bow River; $82,500 re concrete bridge across Elbow River, and $173,000 re bridge at Bow River.

General Industrial

Silverton, B.C.—The Standard Mine has just installed a new air compressor.

Saskatoon, Sask.—George G. Metzner, of Toledo, O., may build a linseed oil plant here.

Aylmer, Ont.—Fire did $800 damage to machinery and supply house at the brick yard of Captain Light.

Brandon, Man.—The Everfresh Co., Ltd., of Calgary, will establish a $15,000 plant here next spring.

Regina, Sask.—C. E. McQuaid, of this city, says an American company will build a gas plant here.

Oshawa, Ont.—A boiler at the gas works exploded on Sept. 13 and wrecked the building. The loss was $20,000.

Aurora, Ont.—F. Smith Co., Ltd., will erect a plant here to manufacture calf meal. F. Smith, Toronto, is president.

Calgary, Alta.—The general Supplies Co. has been awarded contract by city for supplying valves and steampipes at a cost of $26,000.

St. Frances, Ont.—A paper mill is being built here, and will be operating January 1. A large shipment of machinery has been made.

Chatham, Ont.—An important deal has just been consummated here by which the Union Gas Co. secures control of the Tilbury Town Gas Co., Ltd.

Nelson, B.C.—The new powder mill of the Kootenay Explosives Co., at Granite, has commenced to manufacture at the rate of three tons of powder per day.

Saskatoon, Sask.—The Great West Textile Co. will locate a plant here to manufacture linen, etc. It will be moved from Regina. A. W. Ford, Regina, interested.

Grand Forks., B.C.—The Boundary Mining and Exploration Co., Ltd., will instal more powerful machinery for mining coal. A. E. Watts, of Wattsburg, is president.

London, Ont.—The Battle Creek Toasted Corn Flakes Co. will build, on Dundas Street, an addition to their plant measuring 40 x 90 ft., four stories, and costing $25,000.

Medicine Hat, Alta.—Warren Overpack, has bought the brick plant of the Purnal Brick Company there, and will install new machinery to increase the capacity to 100,000 bricks per day.

Montreal, Que. — An order for the winding-up of the Atlas Glass Works, Limited, has been granted, and the Quebec Savings and Trust Co. have been appointed provisional liquidators. This company, which is a new concern, has been forced into liquidation because it was unable to complete its financing. It has an indebtedness of $146,000 over its bonded indebtedness. The company was capitalized at $1,500,000.

Marine

Sarnia, Ont.—Extensive repairs are being made to the Northern Navigation freight sheds at Point Edward.

Quebec, Que.—The Harbour Commissioners' yacht Gossoon, a new craft 30 ft. long, was burned recently, and will be replaced.

Toronto, Ont.—V. T. Bartram, dredging contractor of Toronto, lost a dredge worth $25,000 in the St. Lawrence River last week. He also lost two scows worth $8,000 each. His loss is only partly covered by insurance.

Sarnia, Ont.—A number of repairs are being made to the Northern Navigation freight sheds at Point Edward, with a view to the better handling of the freight when the big rush starts in a few weeks. The company is enlarging the big doors and making other changes.

St. Catharines, Ont.—Notices have been sent out to the farmers residing along section No. 2 of the new Welland Ship Canal whose land has been expropriated by the Government, advising them that the land required by the canal authorities must be vacated by October 1 next. Tenders have not been called for this section of the work, but will be in a few days' time. The filing of notices to vacate is taken as an indication that work will commence very shortly on this part of the canal.

Contracts Awarded

Lindsay, Ont.—The firm of J. G. Edwards have been awarded the contract for steel for the Mud Lake Narrows Bridge.

Ottawa, Ont.—At a recent meeting of the Cabinet Council a contract for a new drill hall at Winnipeg was awarded to Halls-Aldinger Company of Winnipeg, for $519,000.

Ottawa, Ont.—A concrete foundation and piers in connection with the Lachine Canal at St. Gabriel, to cost $14,433.75, will be built by K. A. Morrison, of Ottawa, for the Government.

Swift Current, Sask.—The Ambursen Hydraulic Construction Co., Montreal, has been awarded the contract for the construction work on the new dam across the Swift Current River.

Ottawa, Ont.—John A. Donovan and W. A. McCarthy, of Belleville, were awarded the contract for a new swing bridge over the Rideau Canal, to cost $10,380, by the Government.

Winnipeg, Man.—J. G. White & Co., of New York, have been awarded a contract for a new plant to cost $5,000,000, for the Winnipeg Electric Railway Co. on the Winnipeg River at Grand Bonnet Falls.

Fort William, Ont.—P. J. Tharle, of the local constructing firm of Crockett & Tharle, announces that the firm have been awarded the contract to build a million dollar addition to the parliament buildings in Ottawa.

Winnipeg, Man.—The Board of Control has awarded the Canadian Westinghouse Co. the contract for supplying three generators for the municipal power house at Point du Bois. The contract price is $103,800.

Winnipeg, Man.—The Board of Control has awarded the Linde-Canadian Refrigeration Co., Montreal, the contract for supplying a motor-driven refrigerating plant and refrigerator boxes for King Hospital. The contract price is $12,470.

Montreal, Que.—The Canadian Vickers Co., Limited, has awarded the Mc-

Arthur Concrete, Pile and Foundation Co., New York, the contract for the foundations of the new shipbuilding plant. About 750 pedestal concrete piles will compose the foundation.

Victoria, B.C.—The contract for the construction of the line of railway for the Canadian Northern Pacific from Patricia Bay to the entrance of the Songhees reserve terminals at Victoria has been awarded to A. J. Macdonald and the Nettleton, Bruce, Elsback Co., the work embracing a joint contract.

Trenton, Ont.—The contracts for the erection of a new station, a freight shed, an enclosed tank of 40,000 gallons capacity, tool house, turntable, twelve-stall locomotive house, machine and boiler house and coaling plant have been awarded to the John Metcalf Co., of Montreal, by the Canadian Pacific Railway.

Ottawa, Ont.—The tender of the Canadian Stewart Contracting Company, of Montreal, for another large section of the Toronto harbor improvement work, amounting to $5,760,000, has been accepted by the Dominion Government. A short time ago the same company was awarded the harbor dredging contract, totalling $5,250,000.

Montreal, Que.—E. G. M. Cape, New Birks building, Montreal, is the general contractor for the $1,000,000 steel works to be built at Longueuil for Armstrong Whitworth Co. The mill work will be done by Pringle & Co., Ltd., of Belleville, Ont., and the roofing and sheet metal by the Metal Shingle & Siding Co., 91½ Delorimier Avenue.

New Incorporations

Kerry & Chace, Ltd., incorporated at Toronto, capital $40,000, to carry on the business of engineers and contractors at Toronto. Incorporators: John G. G. Kerry, William G. Chace, etc., Toronto.

The Gaspe Steam Ship Co., incorporated at Quebec to construct, own, etc., tugs, barges, etc., at Quebec, P.Q., with $100,000 capital. Incorporators: Edouard Bouchard, Francois Bouchard, etc., Quebec.

The Castings of Ottawa Co., has been incorporated to manufacture iron and steel articles; $40,000; by James Oliver, Alexander Campbell, William A. L. Oliver, and Harry M. Lee, all manufacturers of Ottawa.

Hawkesbury Board & Paper Mills, Ltd., incorporated at Ottawa, capital $2,000,000, to carry on the business of manufacturers of lumber, etc., at Montreal. Incorporators: Aubrey H. Elder, Samuel T. Mains, etc., Montreal.

Building Notes

Toronto, Ont.—A six-storey, reinforced concrete building, 206 feet wide and 200 feet long, is to be erected on the northwest corner of Dupont and Christie Streets by the Ford Motor Car Co. at a cost of $250,000.

Wood-Working

Sault Ste. Marie, Ont.—Fire did $15,000 damage to the mill of the Sims Lumber Co., Bay Street, on Sept. 11.

Robertson, Que.—The saw mill of Geo. Rousseau, at Robertson Station, on the Quebec Central Railway, was destroyed by fire on Sept. 9. The loss is about $4,000.

Jonquiere, Que.—The window and door factory of the Jonquiere Manufacturing Co., Limited (Marois & Girard), destroyed by fire recently, was valued at $20,000, and only about $4,000 insurance was carried. The fire throws about fifty people out of employment.

Railways—Bridges

Shelburne, Ont.—The by-law to provide for the construction of waterworks for the village by issue of debentures for $12,000 was carried by the burgesses.

Port Coquitlam, B.C.—Equipment and boarding cars of the Hamilton Bridge Co. have arrived for work on the construction of the triple-track bridge over the Coquitlam River.

St. Catharines, Ont.—The C.N.R. has informed the City Council that it is not ready yet to build a line from Toronto to Niagara, and so cannot co-operate with the C.P.R. and the city in building a bridge across the old Welland Canal.

St. Catharines, Ont.—The Galt & Preston Electric Railway will build a fast electric line from Hamilton to St. Catharines in conjunction with the C.P.R. Norman M. Todd, president, met the City Council on Friday night and laid his plans before them.

Tenders

Aurora, Ont.—Tenders addressed to the Town Clerk of the Corporation of Aurora will be received until September 24, for the supply of fire pumps, motors, auxiliaries, etc.

Regina, Sask.—Tenders will be received up till the 1st of October, 1913, for supplying equipment for power house. Plans and specifications may be obtained from E. W. Bull, superintendent of Light and Power Commission.

Toronto, Ont.—Tenders will be received up till September 23 for supplying fire alarm boxes, ten-circuit protector board, eight-circuit storage battery board, motor generator set, three full joker sets, copper wire, etc. Plans and specifications may be obtained from the Board of Control. H. C. Hocken, chairman.

Water-Works

Shelbourne, Ont.—This town will spend $12,000 on a waterworks system.

Winnipeg, Man. — Winnipeg City Council has passed a $13,000,000 by-law for the construction of a water system from Shoal Lake.

Crowland, Ont.—A private company is being formed to lay pipe in this district and purchase water from the Welland Commission should the latter deem it inadvisable to expend money for that purpose.

Persona

C. H. Emerson, industrial commissioner of Brantford, Ont., is understood to have resigned.

Geo. Condon has accepted an appointment with the National Steel Car Co., Ltd., of Hamilton, Ont., to represent them in Montreal.

Mr. Ruhl, district engineer of the C.P.R. at Farnham, Que., was presented by the employees with a gold watch on leaving for a new post at New Glasgow, N.S.

Captain Fred. Smart, expert dredgeman, has just returned to Sarnia from Montreal, whither he went for a conference with A. W. Robinson, consulting engineer for the Imperial Government of India, preliminary to going to Glasgow, Scotland, where he will spend six or seven weeks superintending the construction and shipping of an extensive dredging outfit to Bombay, India.

Trade Gossip

The Storey Pump and Equipment Co., Montreal and Toronto have been appointed agents for the Morris Machine Works, Baldwinsville, N.Y., makers of centrifugal pumps.

The Collingwood Shipbuilding Co. held its annual meeting on Wednesday, Sept. 3. The directors of the past year were re-elected. Prospects for the coming year were reported promising.

The Philosophy of Patternmaking.—Toronto Board of Education has for several years imported woodworking machinery free of duty under the classification of philosophical apparatus, but it is now ruled dutiable by the Customs Department.

The William P. McNeil Co., New Glasgow, N.S., have announced a change of name to that of the Maritime Bridge Co., Ltd. The executive and directorate of the new firm is as follows:—Executive—Walter McNeil, president; Kenower W. Bash, vice-president and manager; Robert C. Grant, secretary. Directors—Francis C. McMath, president Canadian Bridge Co.; Phelps Johnson, president Dominion Bridge Co.; G. H. Duggan, general manager Dominion Bridge Co.

The Smart-Turner Machine Co., Hamilton, Ont., have recently received the following orders:—The Canadian Carbide Co., St. Catharines, Ont., Centrifugal Pump; McGregor & Co., Caledonia, Ont., Duplex Pump; F. L. Snively, Dunnville, Ont., Duplex Pump; The Barnett-McQueen Co., Fort William, Ont., Automatic Feed Pump and Receiver; the Aylmer Canning Co., Aylmer Canning Co., Aylmer, Ont., Duplex Pump; The Great Lakes Dredging Co., Port Arthur, Ont., Duplex Pump; The Imperial Oil Co., Sarnia, Ont., Power Rotary Force Pump.

J. L. Kilburn, K.C., Owen Sound, has become a large stockholder in the Canadian Malleable Iron Co. The plant will be doubled in capacity at once. Tenders are being furnished. It is understood that a large contract has been placed with, by one of the leading car companies for half the output of the plant. H. A. Gutenbust, president and general manager, has had experience in the largest malleable iron plants in America, which will be of intrinsic value to this enterprise. It is stated on good authority that the castings turned out in the past six months have met the expectations of manufacturers in Canada.

Henry J. Fuller, president of the Canadian Fairbanks-Morse Co., Ltd., has recently been appointed vice-president of Fairbanks, Morse, & Co., whose headquarters are in Chicago, Ill. Mr. Fuller will be located in New York, and will be in charge of the Eastern field. While he will continue to be president of the Canadian Fairbanks-Morse, Co., Ltd., he will reside in New York, and will attend to the Canadian end by periodical trips to Montreal. In his absence, C. G. Drinkwater, who has recently been appointed vice-president of the Canadian Co., will be in charge of sales in Canada. During his stay in Canada, which has been extended over a period of some 15 years, Mr. Fuller has taken a keen interest in all financial affairs, and now acts as director of a number of Canadian firms.

Catalogues

The Dept. of the Interior, Bureau of Mines branch of the U.S. Government has published Mineral Technology Bulletin No. 53, entitled, "Mining and Treatment of Feldspar and Kaolin."

The Whitman & Barnes Mfg. Co., Akron, Ohio, have sent us a folder describing their "W. & B." screw and drop forged wrenches. The various types and sizes are illustrated and particulars given of special sets for various purposes. Copies may be had by writing.

The Skinner Chuck Co., New Britain, Conn., have issued a new catalogue and price list of the various types of chucks which they manufacture. A general specification is given of each type of chuck, together with principal dimensions and prices. The catalogue is fully illustrated, and is got up to fit loose leaf price books. Copies may be had on application.

The Storey Pump & Equipment Co., Ltd., Montreal and Toronto, have sent

The Canadian Manufacturers' Association Convention

Of the many Conventions held throughout the year in the more or less important towns and cities of our Dominion, and of the almost numberless topics discussed relative to some form or other of our individual, domestic, social, political and religious well-being, none, we venture to suggest, bear with the same intensity of directness on what is, after all, the mainspring of our national existence—to wit, our commercial standing and ascendency—as does the Annual C.M.A. Convention, its deliberations and decisions.

HALIFAX welcomed with open arms the one hundred and seventy-four members of the Canadian Manufacturers Association, representative of the industries of the Dominion, who had arrived in the city earlier in the day for their Annual Meetings. The Nova Scotia branch of the C. M. A. received the visitors at the station and conveyed them in automobiles to their hotels and temporary homes.

This is the second occasion on which the C. M. A. has met in Canada's eastern gateway and the enterprising folks of the city certainly made a lasting impression on the visitors from all other industrial centres of the Dominion.

The opening session of the convention in the Technical College at 8 p.m. was purely formal. The handsome home of Nova Scotia's technical educational system was ablaze with electric welcomes, and on its walls were many banners and pictures descriptive of the Province's industrial resources. The welcome of the Province was tendered by Premier Murray, who spoke of the importance of the manufacturing industry. He wished the Manufacturers' Association success, and naively hoped that they would be moderate in their demands. Mayor Bligh voiced the city's welcome. F. B. McCurdy, M.P., President of the Halifax Board of Trade, spoke for that body, and told of Halifax's early prominence in banking and the foundation of its wealth in the old days.

A Note of Criticism.

Thomas Cantley, General Manager of the Nova Scotia Steel Co., who welcomed the C. M. A. as its Vice-President for Nova Scotia, strongly criticized the management of the I. C. R. for increasing freight rates, contrasting the burden placed on the Maritime Provinces thereby with the free canals in Ontario. He also took a strong stand on the tariff, pointing out that the situation so far as the steel makers were concerned was becoming intolerable, and took a rap at his fellow-manufacturers by pointing out that they were importing much of their steel free and getting a duty on the finished product.

President Gourlay responded on behalf of the Canadian Manufacturers' Association, declaring that it stood no less for manufacturing and industrial development of the country than for the spiritual development of the country.

BARRINGTON STREET, HALIFAX, NOVA SCOTIA.

President's Address.

The Manufacturers' Association got down to business on the morning of September 17, when R. S. Gourlay delivered the presidential address before 200 delegates. In it, he made the declaration that the C. M. A., while satisfied with the present general level of the tariff, nevertheless contended that revision was necessary at least in regard to the wool, iron and steel schedules.

"It should be made clear and emphatic," he said, "that we are unalterably opposed to any general lowering of the tariff on goods of a class or kind made or produced in Canada." No reference was made to British preference, but Mr. Gourlay contended that the U. S. tariff revision had vindicated the judgment of those Canadians who had opposed the reciprocity treaty. Despite the financial stringency, the president took a hopeful view of the situation, and praised the conduct of the banks. A noble ambition converted into a football of party politics, was his comment on the naval proposals.

Industrial Parliament.

Mr. Gourlay spoke of the annual meeting as being in reality "a parliament of industry," and while the decisions might lack the force of legislative enactments, "their influence for good and evil may be greater and more far-reaching than you know." He hoped they would approach the business before them with broad minds and open hearts, remembering that their first duty was to Canada, and that they must be prepared at all times to subordinate individual advantage to the common good.

The past year had been filled with happenings of great moment, both at home and abroad. "Here in Canada," he said, "it has divided our two great political parties on an issue that should have united, rather than separated them, while the check it has placed on over-speculation and the lessons of business caution taught us have been both timely and salutary."

Money Stringency.

Discussing the money stringency, Mr. Gourlay said the Balkan war and German war tax had led to the hoarding of gold, but these, and like causes, did not satisfactorily explain the Canadian situation, the key to which he believed was in the fact that Canada is financing her rapid numerical growth and development on borrowed capital.

"The wealth of our resources is unquestioned, but that wealth has not yet been converted into money, or into merchantable commodities that can be used

R. S. GOURLAY,
Ex-President, Canadian Manufacturers' Association.

to pay our debts," he said, "Meanwhile our immediate requirements in goods from other nations are far in excess of anything we have to offer in return. For the twelve months ending May our imports for consumption were \$685,000,000; our exports of domestic produce only \$358,000,000. If we go back for ten years the total adverse balance amounts to \$1,051,000,000. This we have had to pay in cash, and we have had to borrow it.

Flooded the Market.

"In the effort to secure capital, we have thrown industrial bonds by the millions, municipal debentures by the tens of millions, and railway securities by the hundreds of millions on to the markets of London, Paris and Berlin. In the natural course of events, it could only be a matter of time till our credit abroad would approach its limit, and this past year the inevitable happened, supplies were in part shut off, carrying charges had still to be met and the result was tight money."

Praise for the Banks.

To say that the banks had refused to provide money for speculative ventures, or for the financing of new enterprises, was to acknowledge that they had chosen rather to reserve their resources, so as to be the better able to take care of legitimate business.

"The money that is loaned by our banks on call outside of Canada is another favorite ground of attack by people who speak with a very imperfect knowledge of the situation," he proceeded. "A bank's call loans are as much a part of its reserve as the gold that lies idle in its vaults, in addition to which they afford an easy means of liquidating, temporarily at least, a substantial portion of our foreign trade indebtedness. It is worthy of note that the amount of money loaned by our banks on call outside of Canada was \$28,000,000 less in July of this year than in 1912.

Financing the crop.

"From now till the first of January, our banks will require to provide in the aggregate a sum sufficient to purchase a grain crop in the west valued at \$200,000,000. It speaks volumes for the banking system of Canada that so large a sum will be provided for so useful, so necessary a purpose, with so little disruption to other business."

Generally speaking, business had been good, but there had been a noticeable falling off in building permits, especially in the west, affecting some trades. Over-speculation, too, in real estate had been followed by depression. He, however, was not anxious. "Under Providence, nothing can stop the progress of this wonderful country."

PLANT OF DOMINION IRON AND

Tariff Policy.

The general revisions of our Canadian tariff synchronized fairly closely with the general revisions of the United States tariff, which was juggled; one set of items would be carried under a high duty one year and low the next, while another set would be raised from a revenue basis to a prohibitive basis.

"For the resultant unsettling of business, which inevitably followed, we find no counterpart in Canada," said the president. "In expressing the hope that this may long continue to be our policy, I do not wish to be understood as of the opinion that the Canadian tariff is not in need of change. Our tariff in the main has been a beneficial one, but it is by no means perfect.

Suggestion for Revision.

"The woollen schedule is not what it should be, otherwise an industry that should be indigenous to an agricultural country like Canada would not have languished as it has. Neither is the iron and steel schedule satisfactory. As at present constituted it is to some extent encouraging the establishment and expansion of what might be called 'secondary industries,' but it is far from adequate in the protection it affords to certain of the more basic branches of the iron and steel trade, where the investment in plant must necessarily be heavy, and where volume of output counts for so much. I cite only these two cases to support my contention that the tariff needs revision and needs it badly.

General Level Satisfies.

"We do not ask nor do we want higher duties all along the line. I am aware that such desires are attributed to us, and will probably continue to be, despite anything we may profess to the contrary. If it will serve any useful purpose, let me here and now, place our association on record once more as being satisfied with the present general level of our tariff, subject to the adjustment of certain defects, such as those I have mentioned.

Demand for Protection.

It should be made clear and emphatic that we are unalterably opposed to any general lowering of the tariff on goods of a class or kind made or produced in Canada. We will stand firmly by the principle we enunciated in this city eleven years ago, namely, that our tariff should be so framed and consistently maintained as to transfer to the workshops of our Dominion the manufacture of many of the goods we new import from other countries."

U. S. Revision.

Mr. Gourlay asserted that the U. S. tariff revision confirmed him in the belief that Canada made no mistake in rejecting the reciprocity agreement of 1911. "In saying this I do not question the value of the market concessions we would have secured thereunder, but whereas then we would have secured these concessions only in return for similar concession on our part, now we are to secure many and some of the most substantial of them without an embarrassing consideration of any kind," he said.

J. H. PLUMMER,
President, Dominion Steel Corporation.

"Cattle, swine, pulp, paper worth up to $2\frac{1}{2}$c a pound, dressed lumber, staves and coke will all enter the U. S. duty free and subject to favorable interpretation fish, coal and wheat will also be free; even under the most unfavorable interpretation of which the foodstuff schedule is capable, wheat will be subject to a duty of ten cents only, as against 25 cents at present, while on fruits there will be material reductions. tions.

Judgment Vindicated.

"The judgment of those who opposed reciprocity on the ground that sooner or later we would have the wider market as a result of United States tariff conditions is thus vindicated; on the other hand, I am sure that the prospect of an early enjoyment of these privileges will assuage the disappointment of those who gave reciprocity their support.

"There are many lines of common manufacture on which the United States duties are still higher than our general tariff, and even more disproportionate in relation to our preferential tariff. The most that can be said of her new average rate of duty is that it will now approximate Canada's."

Continued immigration and the retrenchment due to money stringency had temporarily solved the later situation, the newcomers including 72,243 mechanics, but skilled labor is always in demand.

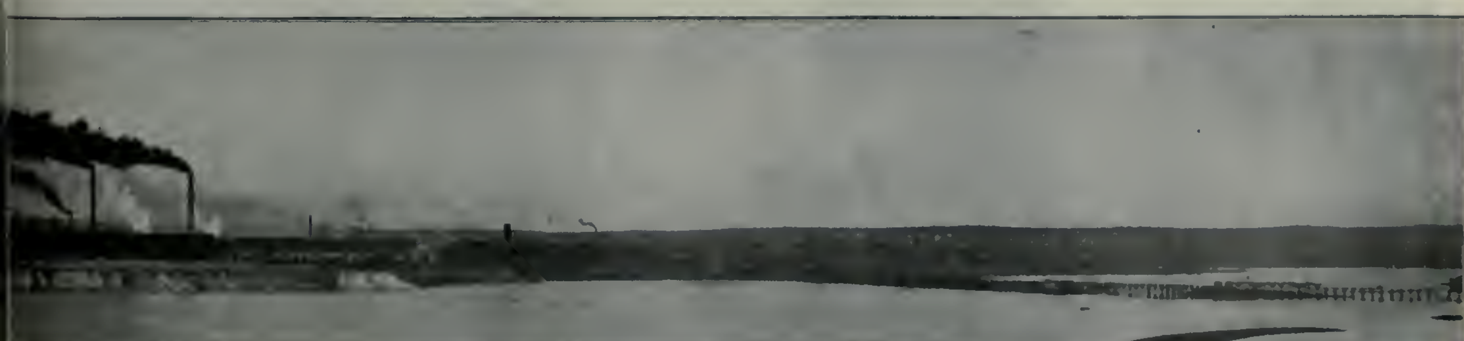
Imperial Defence.

Touching on the question of Imperial defence, President Gourlay referred to the joint resolution passed by the House of Commons in 1909, and said:

"Having thus placed ourselves on record four years ago, we are to-day in the humiliating position of a nation that has pledged itself to a course of action and done nothing, or next to nothing. If the need for action was recognized as imperative in 1909, it is surely far more so to-day. With so impelling a duty before us we have been chagrined and humiliated by the spectacle of a noble ambition converted into a football of party politics.

Shipbuilding in Canada.

"The feasibility of building in Canada all or any of the vessels that shall constitute our contribution to the defence of the Empire is a matter which should be left for experts to decide. That we could build them goes without



EEL CO., LTD., SYDNEY, NOVA SCOTIA.

saying, were the question of cost to be left out of consideration. Certain it is, too, that we will never have in Canada naval shipyards worthy of the name unless we some time make a beginning, and I am sure I am right in crediting you all with a desire to see our country possessed of such equipment at the earliest practicable date.

Humble Beginning.

"I am constrained to believe that Canada would be wise to content herself with the building of smaller vessels and other work incident thereto as a commencement, leaving to the naval yards of England for the time being the task of providing the ships that shall proclaim us a nation. What we would all like to see, what we believe will eventually come, is the revival of shipbuilding on a large scale at our ocean ports.

The speaker believed that the broad policies in relation to transportation, fire prevention, workmens' compensation and other matters have heightened the esteem in which the association is held throughout the Dominion.

C.M.A. Work and Progress Record of Past Year

The Officers' and Committees' Reports submitted to the Convention give unmistakable indication of activity, accomplishment on behalf of and abiding confidence in the future of our country reaching one day the front rank of the World's Commercial Nations.

STANDING COMMITTEES' REPORTS.

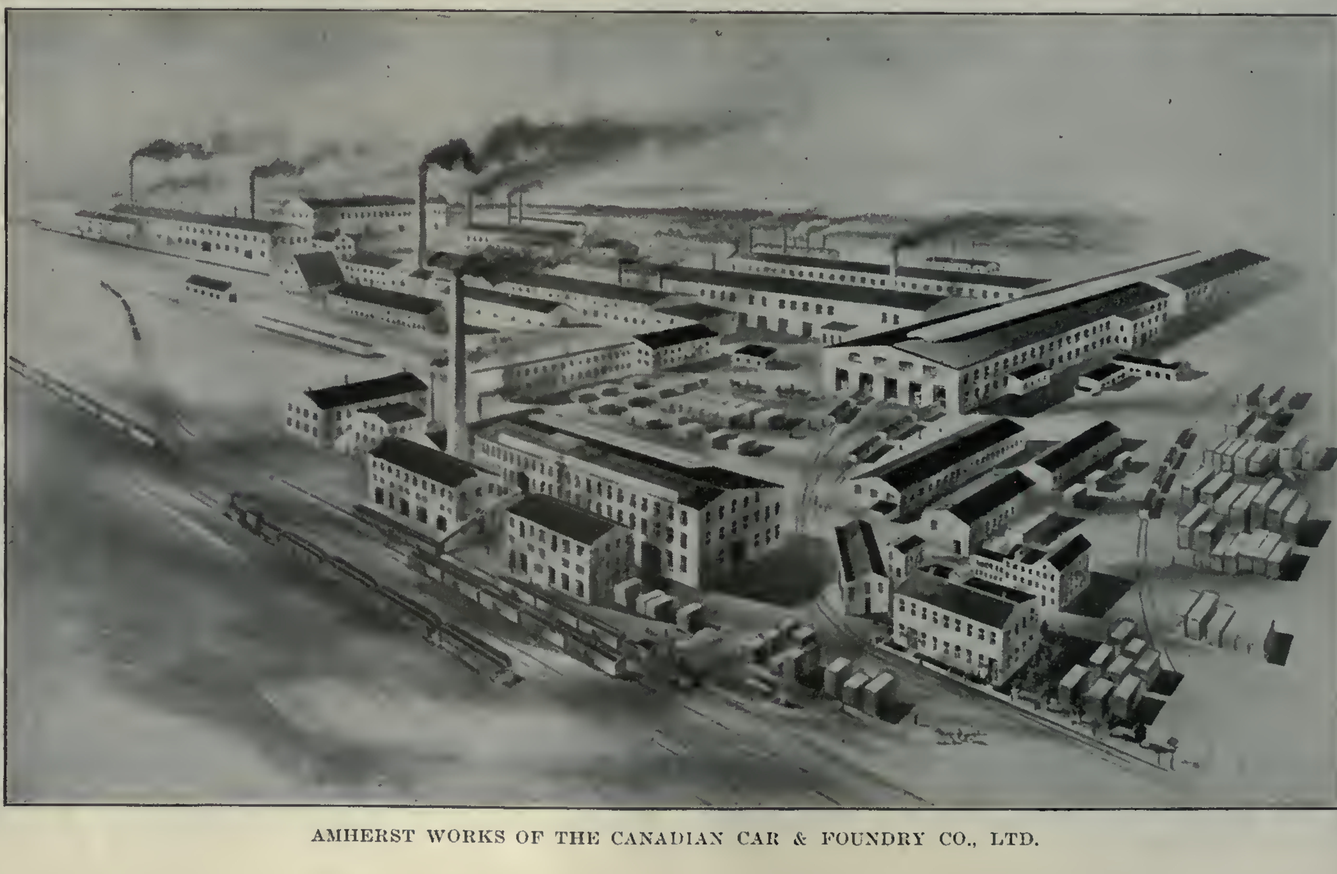
THE Assembly Hall of the Halifax Technical College building was packed to capacity with several hundreds of the leading manufacturers of Canada on Wednesday afternoon, September 17, to hear Reports of the Standing Committees as submitted for the consideration of the Annual Meeting. Considerable interest was evinced owing to the variety of vital subjects to be discussed. These included technical education, workmen's compensation, several important legal questions, as well as several radical changes in by-laws suggested by the general secretary governing the admission of new members.

Secretary's Report.

The most important statements made by Mr. G. M. Murray, the general secretary, were under the heading of new by-laws. His first suggestion was that the fiscal year, which up to the present has ended on July 31, be changed to April 30, and that the Convention be held in June. His chief reasons for suggesting this were, firstly, the difficulty of holding committee meetings in August on account of holidays, and the difficulty the members of the staff had in getting away for their vacations during the summer months. Mr. Murray referred also to the provision of an Executive Committee from among the members of the Executive Council, so as to centralize in one body the business management of the Association's affairs, instead of dividing the responsibility over four different committees. Such a committee, he said, would relieve the Council of much of its routine work, and he believed it would simplify and expedite their accountancy work.

Reception and Membership Committee Report.

The chairman of this committee was Mr. C. B. Lowndes. Satisfactory progress in membership returns was reported, and it was pointed out that there were sufficient eligible and desirable manufacturers outside the fold to allow of a further increase. The committee, however, deemed it prudent for the future to be satisfied with moderate gains. Referring to the by-law revision, the committee believed that in stipulating that an applicant for membership must at least employ five hands in his mechanical department, the association was taking a desirable step in the direction of more precisely defining what should constitute eligibility for membership. Beyond that point, no attempt would be



AMHERST WORKS OF THE CANADIAN CAR & FOUNDRY CO., LTD.

made to define what is a manufacturing business and what is not.

Insurance Committee Report.

The chairman was Mr. H. W. Fleury, and the vice-chairman, Mr. C. C. L. Wilson. Attention was again drawn to the necessity of a fire marshal, and the hope expressed that the promised legislation in Ontario for the creation of such an official would be given practical effect at the next session of the Legislature.

The financial condition of the country had not been favorable to the expenditure of large sums of money for protective fire appliances, yet plans had been made by the Associations' engineers for 39 sprinkler equipments, as against 42 in the preceding year, 20 of which had been completed.

Parliamentary Committee Report.

Chairman, Mr. Thomas Findley. The most important subject dealt with by this committee was that of the jurisdiction between the Provinces and the Dominion in respect to Company Incorporation and Registration. What the committee had to say upon this subject is given in full below:

"The stated case referred to the Supreme Court by the Dominion Government covering the disputed questions of jurisdiction between the provinces and the Dominion in respect to this subject was heard in February, the Association being represented by Mr. F. H. Chrysler, K.C., and Mr. Wegenast. The case of the John Deere Plow Co. v. Agnew, one of the test cases, by supporting which the Association had designed to insure a determination of the issues in which the members were most vitally interested, was heard at the same time.

"In this latter case, the plaintiff, the John Deere Plow Co., had been operating under a Dominion charter, with head office at Winnipeg, and carrying on a general business in agricultural implements throughout the Western Provinces. The Company had applied for a license in the Province of British Columbia, but was refused because another company of a similar name, incorporated by one of the American States, had previously become registered in the province. The position was, therefore, that by the operation of the Provincial law a Company duly authorized by the Dominion Government to carry on trade throughout Canada was finally and absolutely excluded from the Province of British Columbia.

"The position which had been taken on behalf of the Association was that a Dominion charter should entitle a Company to carry on business throughout the whole of Canada without the necessity of licensing or registration, practically amounting to re-incorporation, in each of the provinces. The Company sued upon a claim against a merchant in British Columbia who had refused to pay, pleading the incapacity of the Company, by reason of the Provincial Act. to take any proceedings against him. The Provincial Court upheld this contention, and the validity of the Provincial Act which rendered the Company impotent to bring the action.

"The Supreme Court of Canada, on appeal, held that the transaction out of which the claim had arisen did not show that the Company had been actually carrying on business in the province, so that it was not necessary to decide the constitutionality of the Provincial Act. As a matter of fact, the defendant had acted as the representative of the Company under an ordinary form of exclusive territory contract. The goods supplied to him were to remain the property of the Company until paid for; the defendant was to take lien notes in favor of the Company; the proceeds of the goods, if paid to the defendant, were to be held in trust for the company; the defendant was to keep the goods insured by a policy in the name of the Company, and was to sell the goods at certain prices.

"The court having held that these circumstances did not constitute a carrying on of business within the very comprehensive terms of the Act, your committee deemed it wise not to disturb the decision by encouraging an appeal. It was found, however, that the same Company had in contemplation a number of other actions, by means of which to secure a determination of its status in the Province of British Columbia. One of these was a friendly action by one of the shareholders of the Company to restrain the Company by an injunction from carrying on business in the Province. The other was a claim against a customer in the Province in which the circumstances showed clearly a carrying on of usiness through a duly authorized representative. Both these actions have been brought and decided by the trial judge against the Company.

"At the suggestion of your committee an application was made by the Company for leave to appeal direct from the

YARMOUTH, NOVA SCOTIA, AND ITS SHIPPING.

judgment of the trial judge to His Majesty's Privy Council, and this application has been allowed with a direction that the Attorneys-General of the Dominion and the four Western Provinces should be served with the order allowing the application, and should be given leave to intervene. The cases should come on for hearing in the ordinary course in November, but it is possible that upon application of one or more of the Provinces, the hearing may be postponed until February.

"Your committee are advised that the cases are regarded by the Privy Council as perhaps the most important constitutional cases that have come before that body from Canada. It is confidently expected that the result of the hearing will be the determination of the long outstanding issue between the Provinces and the Dominion which has been a source of great difficulty to all companies engaged in manufacturing and commerce. Meanwhile the judgment of the Supreme Court upon the stated case above mentioned has not, up to the date of the writing of this report, been handed down. It is quite possible that the decision in this case when issued may afford a satisfactory solution, subject, of course, to an appeal to the Privy Council. Your committee propose to continue their endeavors to protect the interests of members by giving the closest attention to these issues. The subject is as complicated as it is important, and the committee bespeak the continued support and confidence of the Association in dealing with it.

"In the meantime, the Legal Department is uniformly advising companies, whether operating under Dominion or Provincial charters, to refrain from registering in any Province, unless there are special circumstances demanding immediate action. In particular, it is unwise for Provincial Companies to take out licenses on the basis of their Provincial Charters. The course suggested, where action is necessary on the part of a Provincial Company, is to take out a Dominion Charter and to defer, as far as possible, the obtaining of Provincial licenses until the cases now before the courts are finally decided.

"The Department is in a particularly advantageous position to advise members in all matters of Company organization and administration, and to undertake any work connected therewith. It is part of the regular work of the Department to procure charters for Companies newly organized or reorganizing, and to take out licenses where it is deemed necessary. A considerable amount of this work has been done during the past year, and members are invited to make full use of the facilities of the Department for the coming year, either directly or through their own solicitors. It may be added that, in a large number of cases which regularly come before the Department, it is found that considerable inconvenience and expense could have been saved by earlier consultation."

WORK TRAIN, ST. JOHN VALLEY RAILWAY, FREDERICTON, N.B.

PLANT OF THE CANADIAN COTTON CO., LTD., FREDERICTON, N.B.

The committee reported having approved of the general principle of a bankruptcy measure. Owing to the fact that the Winnipeg branch of the Association had opposed the principle, the committee asked that the Convention give some further direction in this matter, so that they (the committee) might be guided during the coming year. It was also suggested that further discussion of a resolution of the Montreal Branch favoring the establishment of a system of commercial courts to deal with claims and disputes in connection with commercial transactions be deferred pending the outcome of the agitation in favor of a bankruptcy system.

The committee renewed their protest against the unjust discrimination of the immigration regulations of the Dominion Government in favor of agricultural and other laborers, and against industrial laborers of other classes. Attention was drawn to that fact that persons entering the country to take employment in a manufacturing industry were required to have a certain sum of money, whereas agricultural laborers required no such qualification. Reference was also made to the new Steam Boiler Act of Ontario calling for the inspection of boilers under construction, to which the Legal Department had secured modifications.

Workmen's Compensation Report.

Chairman, P. W. Ellis. This was a special committee appointed to look into the proposed Workmen's Compensation system for Ontario, and to view the subject from the aspect of the whole Dominion. It was suggested that the committee be reappointed, so that its membership would have all the provinces represented. The committee reported that in Provinces where a Workmen's Compensation Act was in operation, employers were anything but satisfied with its operation. Referring to the proposed Act outlined by Sir William Meredith for the Province of Ontario, it was observed that no Government could consider seriously the adoption of Sir William's schedules or his Draft Act in their present form. It was proposed to await the action of the Government upon the report and draft. Energetic action on the part of the Association might be necessary, but the committee hoped that the Government would exercise the caution which the subject demanded. Because of the complex nature of the subject, a defect in any one of a score of features of a concrete system might mean the difference between failure and success, and, apart from the features of immediate interest to manufacturers, they were anxious to have the system adopted a successful and a model one. The committee desired to emphasize the importance of having the membership of the Association informed upon this subject, and, therefore, supplied the following questions and answers:

Tariff Committee.

Chairman, W. C. Phillips. The principal matters dealt with by the Tariff Committee comprised a large number of questions relating to the administration of the present Act, the extension of the British Preferential Tariff to a number of British Colonies not heretofore enjoying the preference, the renewal of the Japanese Treaty, and the tariff changes of last session which were largely necessary under the recent trade agreement between Canada and certain British West India colonies. Brief reference was made to the United States Tariff Bill, and to the fact that the Association's tariff officer was keeping in touch with the changes being introduced in this bill from time to time.

W. W. BUTLER.
Vice-President Canadian Steel Foundries, Ltd.

Technical Education Committee.

Chairman, J. S. McKinnon. This committee recalled the fact that since it first came into being in 1904, its activity had been centred on one objective—namely, the establishment of a comprehensive national system of industrial education, so planned as to take care of the needs of all classes and of all localities. Efforts were directed towards inducing the Federal Government to appoint a Royal Commission of Enquiry, and in 1910 the desired committee was appointed. The committee believed that the report placed at the disposal of the Canadian people would prove of inestimable value, not only in giving intelligent direction to, but in stimulating technical and vocational education of every kind in all parts of the Dominion. It was a little early to look for any definite announcement of the Government in this regard, but the committee had good reason to attach little importance to the rumors to the effect that the Government was indifferent. If the Ministers had refrained so far from committing themselves, it was only because of the unfortunate delays that have attended the appearance of the last two volumes of the report.

It was suggested that the Government may deem it wise to defer action until officially urged thereto by the Provinces. The Commission, it was pointed out, was appointed by the Laurier Government, and the present Government might with some justification demur at giving effect to its findings without some assurance from the Provinces that such action would be welcome. The committee suggested that no time should be lost in urging upon the various Provincial Governments the desirability of placing themselves on record as being entirely in sympathy with what the Royal Commission has proposed.

REPRESENTATIVE MANUFACTURERS AT THE CONVENTION.

THE following manufacturers' representatives travelled on the special C.M.A. train which left for Halifax on Saturday, September 13:

Anderson, W. J., Stratford Chair Co., Ltd., Stratford, Ont.

Benjamin, A. W., Benjamin Mfg. Co., Ltd., Yarker, Ont.

Benjamin, Mrs., A W., Yarker, Ont.

Bertram, Henry, John Bertram & Sons Co., Ltd., Dundas, Ont.

Bertram, Mrs. Henry, Dundas, Ont.

Bettesworth, A. E. A., Bush & Co. (Canada), Ltd., Montreal, Que.

Bristol, J. R. K., Manager Tariff Department, C.M.A., Toronto, Ont.

Bryan, F. W,, Manufacturing Co., Ltd., Collingwood, Ont.

Burton, E. S., Canadian Dyers' Association, Ltd., Toronto, Ont.

Burton, Mrs. E. S., Toronto, Ont.

Campbell, Jas. B., American Can Co., Montreal, Que.

Carlisle, C. H., Goodyear Tire and Rubber Co., Ltd., Toronto, Ont.

Champ, H. H., Steel Co. of Canada, Ltd., Hamilton, Ont.

Cheston, F. C., Canadian Linderman Co., Ltd., Woodstock, Ont.

Chown, G. Y., Wormwith Piano Co., Kingston, Ont.

Clarke, A. R., A. R. Clarke & Co., Ltd., Toronto, Ont.

Clarke, Mrs. A. R., Toronto, Ont.

Cleland, J. H., Meaford Wheelbarrow Co., Ltd., Meaford, Ont.

Cleland, Mrs. J. H., Meaford, Ont.

Cliff, Geo. J., Canadian Salt Co., Ltd., Toronto, Ont.

Cliff, W. C., R. D. Fairbairn Co., Ltd., Toronto, Ont.

Coe, R. T., Canadian Sirocco Co., Ltd., Windsor, Ont.

Coe, Mrs. R. T., Windsor, Ont.

Colby, J. R., Canadian Carbonate Co., Ltd., Montreal, Que.

Copping, Geo. R., Barber Paper & Coating Mills Co., Ltd., Toronto, Ont.

Copping, Mrs. Geo. R., Toronto, Ont.

Cowan, C. G., American Bank Note Co., Ltd., Ottawa, Ont.

Cowan, Mrs. C. G., Ottawa, Ont.

Currie, H. A., Wilson Bros., Ltd., Collingwood, Ont.

Currigan, Mrs. G. W., Stanbridge East, Que.

Daly, H., National Cash Register Co., Toronto, Ont.

Daniel, C. D., Toronto Pharmacal Co., Ltd., Toronto, Ont.

Desbarats, W. A., Desbarats Printing Co., Ltd., Montreal, Que.

Doolittle, E. A., Orillia, Ont.

Drewry, F. W., Edward L. Drewry, Winnipeg, Man.

Dunn, W. R., International Harvester Co., Ltd., Hamilton, Ont.

Dunn., Mrs. W. R., Hamilton, Ont.

Edmonds, W L., Commercial Press., Ltd., Toronto, Ont.

E. J. Leffert, Leffert Table Co., Berlin, Ont.

PRESIDENT GOURLAY'S INDUSTRIAL SUMMARY.

"Over-speculation has been checked, and the reign of business caution inaugurated.

"The key to the present financial stringency is that Canada is financing her rapid numerical and material growth and development on borrowed capital.

"Canada's huge indebtedness abroad has resulted in the inevitable. Supplies were, in part, shut off, carrying charges had still to be met, and the result was tight money.

"Criticism of Canadian banks is unjustified because they have acted the part of prudence and caution.

"Nothing can stop the progress of the wonderful country we boast as our heritage.

"We do not ask, nor do we want, higher duties all along the line.

"We are unalterably opposed to the lowering of tariff on goods of a class or kind made in Canada.

"It does not require much stretch of the imagination to picture Canada as a country celebrated for its shipbuilding."

Fairbairn, Ed., Ontario Wind Engine and Pump Co., Buffalo, N.Y.

Fairbairn, Mrs. Ed., Buffalo, N.Y.

Fairbairn, Rhys D., R. D. Fairbairn Co., Ltd., Toronto, Ont.

Firstbrook, John, Firstbrook Bros., Ltd., Toronto, Ont.

Firstbrook, Mrs. John, Toronto, Ont.

Fraser, A. W., Fraser Cap Co., London, Ont.

Fraser, Mrs. A. W., London, Ont.

Galbraith, H. S. Y., B. C. Mills Timber & Trading Co., Ltd., Winnipeg, Man.

Galbraith, Mrs. H. S. Y., Winnipeg, Man.

Gartshore, W. M., McClary Manufacturing Co., London, Ont.

Gordon, C. B., Dominion Textile Co., Ltd., Montreal, Que.

Gourlay, David R., Gourlay, Winter & Leeming, Toronto, Ont.

Gourlay, Mrs. David R., Toronto, Ont.

Gourlay, R. S., Gourlay, Winter & Leeming, Toronto, Ont.

Gourlay, Mrs. R. S., Toronto, Ont.

G. J. Stanley, Stanley Aluminum Co., Toronto.

Harris, Sam, Harris Lithographing Co., Toronto, Ont.

Harris, W. G., Canada Metal Co., Toronto, Ont.

Harris, Mrs. W. G., Toronto, Ont.

Hart, M. M., S. R. Hart & Co., Toronto, Ont.

Hatch, Arthur F., Canada Steel Goods Co., Ltd., Hamilton, Ont.

Hewitt, J., Canadian Shredded Wheat Co., Ltd., Toronto, Ont.

Hobbs, J. W., Consolidated Plate Glass Co., Ltd., Toronto, Ont.

Howie, N. A., J. J. McLaughlin, Ltd., Toronto, Ont.

Hubley, T. A., Howard Smith Paper Mills, Ltd., Montreal, Que.

Henry Ross, American Can Co., of Montreal.

Jackson, Thos., Jackson Manufacturing Co., Clinton, Ont.

Jackson, Mrs. Thos., Clinton, Ont.

Jeffrey, A. H., Polson Iron Works, Ltd., Toronto, Ont.

Jephcott, Alfred, Dominion Paper Box Co., Ltd., Toronto, Ont.

Jephcott, Mrs. Alfred, Toronto, Ont.

Jones, J. L., J. L. Jones Engraving Co., Toronto, Ont.

J. R. Snow, Century Manufacturing Co., Woodstock.

Kinzie, O., Walker Bin & Store Fixture Co., Ltd., Berlin, Ont.

Kinzie, Mrs. O., Berlin, Ont.

Keens, J. H., Keens Mfg. Co., Toronto, Ont.

Keens, Mrs. J. H., Toronto, Ont.

Knight, A. Cecil, Lever Brothers, Ltd., Toronto, Ont.

Kyle, S. L., Kyle's Cabinet Works, Ltd., Ottawa, Ont.

Kyle, Mrs. S. L., Ottawa, Ont.

Laidlaw, W. C., Laidlaw Lumber Co., Ltd., Toronto ,Ont.

Liersch, E., Canada Linseed Oil Mills, Ltd., Montreal, Que.

Liersch, Mrs. E., Montreal, Que.

Lowndes, J. M., The Lowndes Co., Ltd., Toronto, Ont.

Lowndes, Mrs. J. M., Toronto, Ont.

Luscombe, G. H., Brook Woollen Co., Ltd., Simcoe, Ont.

McCarter, J. B., Eclipse Whitewear Co., Ltd., Toronto, Ont.

McDougald, D., Beverley Wood Speciality Co., Ltd., Toronto, Ont.

McGregor, G. M., Ford Motor Co. of Canada, Ltd., Walkerville, Ont.

McGregor, Mrs. G. M., Walkerville, Ont.

McGregor, W. L., McGregor Banwell Fence Co., Ltd., Walkerville, Ont.

McGregor, Mrs. W. L., Walkerville, Ont.

McLagan, G. W., The George McLagan Furniture Co., Ltd., Stratford, Ont.

McLaughlin, R. S., McLaughlin Motor Car Co., Oshawa, Ont.

McLaughlin, Mrs. R. S., Oshawa, Ont.

McMahon, J. A., Union Drawn Steel Co., Ltd., Hamilton, Ont.

McMahon, Mrs. J. A., Hamilton, Ont.

Maher, T. J., Henry K. Wampole & Co., Ltd., Perth, Ont.

Matthews, H. L., Matthews Bros., Ltd., Toronto, Ont.

Matthews, Mrs. H. L., Toronto, Ont.

Matthews, Miss, Toronto, Ont.

Meadows, Geo. B., The Geo. B. Meadows Toronto Wire, Iron & Brass Works Co., Ltd., Toronto, Ont.

Meadows, Miss, Toronto, Ont.

Meldrum, H. T., Assistant Secretary, C.M.A., Montreal, Que.

Moore, Chas., Stratford Mfg. Co., Ltd., Stratford, Ont.

Morgan, Miss C., C.M.A., Toronto, Ont.

Murphy, M. G., C.P.R. representative, Toronto, Ont.

Murray, Howard, Shawinigan Water & Power Co., Ltd., Montreal, Que.

Murray, Mrs. Howard, Montreal, Que.

Murray, G. M., Secretary, C.M.A., Toronto, Ont.

Murray, Mrs. G. M., Toronto, Ont. .

Niegborn, A., Nichols Chemical Co., Ltd., Toronto, Ont.

Niegborn, Mrs. A., Toronto, Ont.

Parke, George, Parke & Parke, Hamilton, Ont.

Parke, Mrs. George, Hamilton, Ont.

Parsons, S. R., British American Oil Co., Ltd., Toronto, Ont.

Pauze, Frank The U. Pauze & Fils Co. Ltd., Montreal, Que.

Pauze, Mrs. Frank, Montreal, Que .

Pettit, C. Stanley, Delany & Pettit, Ltd., Toronto, Ont.

Pettit, Mrs. C. S., Toronto, Ont.

Phillips, W. C., Phillips Mfg. Co., Ltd., Toronto, Ont.

Richardson, S. G., William Peace Co., Ltd., Hamilton, Ont.

Riordon, Jas. A., Standard Sanitary Mfg. Co., Ltd., Toronto, Ont.

Riordon, Mrs. Jas. A., Toronto, Ont.

Sadler, G. W., Sadler & Haworth, Montreal, Que.

Sadler, Mrs. G. W., Montreal, Que.

Saunders, A., Goderich Organ Co., Ltd., Goderich, Ont.

Saunders, Mrs. A., Goderich, Ont.

Saunders, Miss, Goderich, Ont.

Scythes, J. A., Hopkins Mfg. Co., Ltd., Toronto, Ont.

Shapley, W. H., Toronto, Ont.

Sinclair, J. M., Eureka Mineral Wool & Asbestos Co., Ltd., Toronto, Ont.

Rutherford, William, Wm. Rutherford & Sons, Montreal.

Stewart, J. F. M., Pointe Anne Quarries, Ltd., Toronto, Ont.

Stirrett, J. T., Editor "Industrial Canada," Toronto, Ont.

Strudley, H. W., Imperial Rattan Co., Ltd., Stratford, Ont.

Sweeney, H. M., Union Drawn Steel Co., Ltd., Hamilton, Ont.

Sweeney, Mrs. H. M., Hamilton, Ont.

Trenholme, T. A., Montreal, Que.

T. D. Hoag, Board of Trade, St. John, N.B.

Waddie, H. J., Canadian Drawn Steel Co., Ltd., Hamilton, Ont.

Wall, G. H., Great West Lumber Co., Ltd., Winnipeg, Man.

Wall, Mrs. G. H., Winnipeg, Man.

Walsh, J .E., Mgr. Transportation Dept. C.M.A., Toronto, Ont.

Watson, John, John Watson & Son, of Montreal, Ltd., Montreal, Que.

Watson, Mrs. John, Montreal, Que.

Wegenast, F. W., Legal Secretary, C.M.A., Toronto, Ont.

Wegenast, Mrs. F. W., Toronto, Ont.

White, Arthur W., George White & Sons Co., Ltd., London, Ont.

White, Mrs. A. W., London, Ont.

Wickett, S. Morley, Wickett & Craig, Ltd., Toronto, Ont.

Willson, C. H., McDonald & Willson, Toronto, Ont.

Wright, H. G., E. T. Wright & Co., Hamilton, Ont.

Young, A. L., Henry Hope & Sons, Toronto, Ont.

NOVA SCOTIA CONTINGENT.

ON the membership list of the Can. Manufacturers' Association, Nova Scotia in general and Halifax in particular, are well represented. The list for 1912 for this Province totals ninety firms, and this year's additions have brought the number to only two short of the century. Of the grand total, Halifax boasts forty-two members. These up to date are:—

Amherst—Amherst Boot and Shoe Co., Ltd.—C. S. Sutherland.

Amherst Foundry Co., Ltd.—Wm. Knight.

Canadian Car and Foundry Co., Ltd.—Geo. T. Douglas.

Christie Company—J. A. Christie.

Eastern Paint Mfg. Co.—S. Hoffman.

International Works, Ltd., Oxford Worsted Co., Limited. The Rhodes, Curry Co., Limited—Herbert Lockwood, A. F. Felton, A. S. Curry (2nd) W. D. Piercy (3rd.)

Annapolis Royal—Mill, A. D. & Sons, Limited—C. W. Mills.

Antigonish—D. J. Kirk Woodworking and Construction Co.

Hygienic Fresh Milk Co., Ltd.—A. Lapierre.

Bridgetown—MacKenzie Crowe & Co.

Bridgewater—Telfer Bros.; Lahave Pulp Co., Limited—Frank Davison.

Canning—Blenkhorn & Sons, Limited.

Dartmouth—Starr Mfg. Co., Ltd.—H. Goudge.

East Apple River (Cumberland Co.)—White, Chas. T. & Sons, Ltd.—M. Garfield White.

Eastern Harbour, C.B.—Great Northern Mining Co., Limited.

Eureka—Nova Scotia Underwear Co., Ltd.—R. F. Archibald.

Halifax—Acadia Powder Co., Ltd.—T. R. Gue.

Acadia Sugar Refining Co., Ltd.—A. W. Daviss.

Barytes Limited—Henry H. Harrison.

Brander, Morris & Co.—W. R. Bran-

Brandam-Henderson, Limited — Geo. Henderson.

Clayton & Sons—W. J. Clayton.

Davis & Fraser—F. J. Fraser.

Dempster, James, Limited— A. F. Messervey.

Farquhar Bros.—James Farquhar.

Gunn & Co., Limited—E. Sullivan.

Imperial Oil, Limited—J. F. Shatford (2nd.)

Imperial Publishing Co., Ltd.—J. C. Stewart.

Kellys Limited—John F. Kelly.

Longard Bros.—J. P. Longard.

McAlpine Publishing Co., Ltd.—S. R. Frame.

Macdonald & Co., Ltd.—Roderick Macdonald.

Jno. MacInnis & Son.

A. W. MacKinley.

Moir, W. and A.—Alex. Moir.

Moirs, Limited—James W. Moir.

Mott, John P. & Co.—F. I. Ward.

Nova Scotia Car Works, Ltd.—F. M. Brown.

Nova Scotia Fertilizer Co.—C. M. Jack.

Reardon, Frank—Frank Reardon.

Robin Jones & Whitman, Ltd.—A. H. Whitman.

Scotia Pure Milk Co., Ltd.—Chas. N. Butcher.

Silver, H. R. Ltd.—H. R. Silver.

Smith & Proctor—N. B. Smith.

Smith, N. and M., Limited—Howard H. Smith.

Starr, John, Son Co., Limited.

Taylor, The Robert Co., Limited—R. D. Taylor.

Whitman, Arthur N.—Arthur N. Whitman.

Hantsport—Geo. Yeaton & Sons. Limited.

Kentville—Lloyd Mfg. Co.—John I. Lloyd.

Nova Scotia Carriage and Motor Car Co., Limited—G. Gordon Ferris.

La Have—J. F. Creaser Co.

Liverpool—Macleod Pulp Co., Limited—Sidney Downer.

MacClearn Co., Limited.

T. W. Quinn.

Londonderry—Londonderry Iron and Mining Co., Limited—J. P.Edwards.

Lunenburg—Lunenburg Foundry Co., Limited—T. C. Rockwell.

New Glasgow—Bailey, Underwood Co., Limited—John Underwood.

Canada Tool & Specialty Co., Ltd.—R. H. MacKay, M.L.A.

Cumming, J. W. & Son—Jas. T. Cumming.

Dand, Raymond—Raymond Dand.

Drake, Francis—F. H. Drake.

Eastwood, Jas.—Jas. Eastwood.

Garrett, John E.—John E. Garrett.

Grant, John J.—H. G. Grant.

Johnson & MacDonald—J. B. Johnson.

Matheson, I., & Co., Limited—C. M. Crockett.

Nova Scotia Steel & Coal Co., Ltd.—Thos. Cantley.

Rood & MacGregor.

Thompson & Sutherland, Limited—H. T. Sutherland.

Oxford—Oxford Foundry & Machine Co.—H. W. Wood.

Oxford Mfg. Co., Limited.—J. A. DeWolfe.

Pictou—Atlantic Milling Co.

Hamilton, G. J. & Sons—H. H. Hamilton.

Sydney—Dominion Iron & Steel Company, Ltd.—J. P. McNaughton.

Dominion Tar & Chemical Co., Ltd.—The E. B. Smith.

Havelock Bottling Co., Limited—C. H. Stimpson.

Saunderson Mfg. Co., Limited—Arnold O. Saunderson.

Shaw and Mason, Limited—T. P. Mason.

Sydney Cement Co., Limited—H. C. Burchell.

Truro—Bigelow & Hood—J. S. Bigelow.

Durkee, A. A. Co., Ltd.—A. A. Durkee.

Eastern Hat and Cap Mfg. Co., Ltd.—Warren Oglive.

Spencer Bros. & Turner, Ltd.—L. Spencer.

Truro Paper Box Co.

Windsor—Colonial Fertilizer Co.—A. P. Clark.

Smith, J. E., & Co.—J. E. Smith.

Windsor Foundry & Machine Co., Ltd.

Windsor Furniture Co., Limited—F. A. Shand.

Windsor Plaster Co., Limited—C. Henry Dimock.

Yarmouth—Cosmos Cotton Company—G. H. Allen.

Minard's Liniment Co., Limited—C. C. Richards.

New Burrell-Johnson Iron Co., Ltd.—H. S. Crowell.

MARITIME PROVINCE CENSUS RETURNS.

THE following table is taken from the census returns of the Government, compiled in June, 1911, and gives a clear idea of the development which has taken place in the towns and cities of the three Maritime Provinces, namely, Nova Scotia, New Brunswick, and Prince Edward Island:—

In New Brunswick there are twenty-two foundries and machine shops, in which nearly two million dollars are invested.

Halifax harbor is free from ice the whole year round.

Of the 200,000 Canadians in Boston, a considerable proportion are ex-Nova Scotians.

Prince Edward Island, the smallest of

Cities, towns and villages.	Population, 1911.	1901.	Capital, 1910.	Wages, 1910.	Products, 1910.
Nova Scotia	168,181	125,230	67,162,011	7,743,529	40,165,263
Amherst	8,973	4.964	15,763,768	1,147,427	4,625,765
Antigonish	1,787	1,838	35,000	14,411	88,850
Bridgewater	2,775	2,203	196,200	59,013	1,560,364
Canso	1,617	1,479	163,858	12,534	216,145
Dartmouth	5,058	4,806	1,681,396	200.775	1,145,059
Glace Bay	16,562	6,045	38,500	26,609	132,500
Halifax	46,619	40,832	14,068,713	1,735,348	12,140,409
Inverness	2,719	306	4,500	3,200	18.800
Kentville	2,304	1,731	248,077	103,052	307,935
Liverpool	2,109	1,937	111,300	38,500	186,500
Lunenburg	2,681	2,916	189,039	73,287	229.666
New Glasgow	6,383	4,447	1,063.398	346,466	1,034,572
North Sydney	5.418	4,646	159,500	53.360	168,900
Parrsboro	2,856	3,391	99,392	35,306	205,053
Pictou	3,170	3,235	380,000	94,474	627,538
Springhill	5,713	4,559	52.500	10,113	40.200
Stellarton	3,910	2,335	648,588	47,361	200,510
Sydney	17,723	9,909	24,623,033	2,231,327	9,395,017
Sydney Mines	7,470	3.191	1,935,000	287,618	2,540,161
Trenton	1,740	1,274	1,853,000	588,267	2,290,000
Truro	6,107	5,993	2,056,085	298,821	1,334.520
Westville	4,417	3.471	6,000	1,242	5,700
Windsor	3,452	3.398	244,432	114,414	472,723
Yarmouth	6,600	5,430	1,540,732	220.604	1,198,376
New Brunswick	90,241	81,449	22,125,518	5,531,212	23,084,334
Campbellton	3,817	2,652	1,141,500	277,215	1,214,800
Chatham	4,666	4,868	2,704,268	401,043	1,233,436
Dalhousie	1,650	862	700,000	32,900	400,000
Edmundston	1,821	444	12,000	5.500	17,000
Fredericton	7,208	7,117	882,778	346,323	1,397,404
Marysville	1,837	1,892	1,615,000	247,479	1,059,711
Milltown	1,804	2,044	1,306,000	254,287	908.571
Moncton	11,345	9,026	1,666,086	1,010,417	3,233,565
Newcastle	2,945	2.507	450,000	35,988	277,540
St. John	42,511	40,711	9,242,338	2,269,898	10,081,667
St. Stephen	2,836	2,840	950,914	214,129	1,555,291
Sackville	2,039	1,444	413,675	168,899	478,135
Sussex	1,906	1,398	223,359	59,850	169,700
Woodstock	3,856	3,644	817,600	207,284	1,057,514
Prince Edward Island	13,881	14,955	742,184	209,081	946,055
Charlottetown	11,203	12,080	605,284	157,265	738,228
Summerside	2,678	2,875	136,900	51,816	207,827

the "Three Maritime Sisters," has never shone as a manufacturing province.

MINCED MARITIME MATTERS.

THE Nova Scotia Steel & Coal Co. claims to be the first company to make coke in retort ovens.

Sydney contains the plant of the Dominion Iron & Steel Co., valued at $35,000,000.

The Dominion Coal Co., of Sydney, has recently installed a $500,000 coal washer.

Amherst, N.S. has grown from a village to a city in a few years by encouraging industries.

The capital invested in New Glasgow, N.S., has doubled since 1910.

The last convention of the Canadian Manufacturers' Association held in Halifax, was in 1902.

The Government has allotted $500,000 to build a dry dock in Halifax.

In Nova Scotia, there are thirty-five foundries and machine shops, in which are invested $277,000.

St. John, N.B., has grown tremendously since last census, when its population was placed at 42,511.

The population of Halifax in 1911 was 46,619.

Halifax is the winter terminus of the steamboat systems, and all the year round of the Intercolonial Railway.

The young men of Yarmouth, N. S., have adopted the motto, "No Politics—Just Yarmouth," and the watchword, "20,000 in 1912."

A company with $10,000,000 capital will develop hydro-electric power, and extend the street railway lines into the suburbs of St. John, N.B.

"Come East, young man," and "Stay East, young man," are slogans adopted in the Maritimes.

Fredericton, the capital of New Brunswick, claims to supply the cheapest electrical power in the province.

Moncton, N.B., is headquarters of the Intercolonial Railway and the second largest city in New Brunswick.

St. John, N.B., was almost destroyed by fire in 1877.

Truro, N.S., is an important railway centre, with several important industries.

The Maritime Provinces---Facts, Figures and Features

The presence of the Canadian Manufacturers' Association Convention in Halifax N.S., and the visiting representatives' tour of the leading industrial centres of the territory forming the eastermost portion of the Dominion, have conspired to direct special attention to the progress and general importance of this section relative to our commercial well-being. The racy account here given will, we believe, be found interesting and instructive.

DESPITE the fact that this has been more or less of a trying year in industrial and commercial life not only in Canada, but throughout the neighboring Republic and other parts of the world, and the additional fact that the money market had been greatly depressed by various circumstances, actual or imaginary, the Maritime Provinces have plodded along in their even, steady trend of progress, and, with remarkably few exceptions, all big manufacturing houses and industrial concerns will give the same response when asked as to business prospects,—"Never better,." It is surprising, but it is nevertheless true, and reverts one to the old belief, tried and found generally correct, that it is better to go ahead cautiously, even if perhaps slowly, than to "boom" for a time and then be relegated to a position of comparative oblivion in respect to former ideals.

A Marked Steady Growth.

The growth of the three Atlantic Provinces in the industrial and manufacturing world during the last few years has been marked. It has not been slow in the exact meaning of the word, according to one Webster, in fact, if anything it has hen rapid, but the rapidity has been accompanied by a spirit of confidence and optimism that was not allowed to overwhelm all ideas of business caution. It is, however, now showing itself in the encouraging progress of the different towns and cities of the three coastal Provinces of Eastern Canada.

Some people have called it a boom. Others have objected to the term. They have heard of the several western "booms" some of which have exploded, but they have more faith in the possibilities of the eastern townships than fear of any "boom-busting." In the average sense of the word, however, there is a boom, a most persistent one that won't die in the Maritime Provinces, particularly in New Brunswick and Nova Scotia, and there is evidence of it not only in the larger cities but throughout the smaller townships as well The number of young men leaving the three Eastern Provinces for the United States and the Canadian West is not so great now as it used to be, and the trend of immigration will be directed more eastward than to the west in coming years.

The "Harvesters' Excursions" are meeting with quite general opposition from business men, manufacturers, press and public, for they have been a drainage for many years. W. Leonard Palmer, of the London, (Eng.) Financial News, in St. John, last week, spoke most cheerfully of the prospects of Atlantic Canada. He last year visited Halifax, St. John and other maritime centres with a large party of British manufacturers and capitalists on their tour through Canada, and said they were greatly interested in the development of these provinces. "So much so," said he in fact, "that I would not be surprised if within a short time you hear of British industries establishing themselves in New Brunswick or Nova Scotia. Trade conditions in the old country have been such this year that it has

EDWARD PARTINGTON PULP & PAPER CO. MILLS, ST. JOHN, N.B.

been impossible for business men to devote much attention to Canadian fields, but from now on, there will be a change, and the Maritime Province will reap the benefit of the trip of those English capitalists last year." Already, Mr. Palmer said, results of their tour had been shown in Quebec Province.

Progress Writ Large.

There is an old adage to the effect that "Seeing is believing." Well, it isn't a matter of extreme difficulty to see progress written in capital letters in these parts. During the last quarter of a century, things have been pretty well on the "hum," but it is within the last five or ten years that the spirit of industrial activity has been renewed on a more extensive scale than ever. Towns, that a few years ago were unheard of, now find a prominent place upon geographical maps as centres of industry, and the advance of such places as Sussex, Moncton, St. Stephen, Campbellton, Fredericton, St. John and other townships in New Brunswick; Amherst, New Glasgow, Stellarton, the Sydneys and Halifax in Nova Scotia, and Charlottetown and Summerside in P.E. Island, has been truly remarkable.

Factors at Work.

Various factors have had to do with this. Discoveries of iron and coal, the former particularly on the north shore of New Brunswick, and coal and iron in Nova Scotia have been responsible for different industries arising in those parts and towns such as Newcastle, Campbellton, Dominion, New Waterford, spring from mere villages into hives of commercial life. The growth of Sydney has gone along with great strides, the steel works and minor industries helping largely. New Glasgow, Stellarton, Trenton, and Westville together make another city grown upon coal and steel, with subsidiary industries adding to their healthy condition. Moncton has won fame through discoveries of natural gas and nearness to extensive oil areas, both tending to attract industrial concerns. Sussex promises to gain a wider reputation through natural gas; Fredericton is becoming noted as a "shoe town;" and there are many other places in the provinces by the sea which are deserving of mention.

THE T. S. SIMMS & CO. BRUSH FACTORY, ST. JOHN, N.B.

St. John and Halifax.

Primarily of course St. John and Halifax occupy the predominant positions when it comes to a question of industry and trade. They are Canada's winter ports, and as such their names are not confined to children studying the map of their respective province, but are known in all the larger centres of shipping and manufacturing. Merchants, and manufacturers in these cities have not been doing as has been done in the west, "spending too freely and spreading too fast;" then intoxicated by prospects of present success, not looking far enough into the future. No that is not the policy of the directors of industrial destiny in these parts. The old motto "slow but sure" is good enough, provided it is not too slow.

Probably the greatest advantage any industrial city can have is facility for shipping besides nearness to natural products. St. John and Halifax have both of these. Each with an excellent harbor is the centre of Canada's winter trade. So much so is this the case that the Federal Government, realizing the importance of both ports, has issued contracts for work involving millions of dollars in the creation of dry docks, wharves, breakwaters, grain conveyors, etc., while the railways are spending thousands of dollars yearly upon the development of their properties there.

With the general advance of harbor development has come a "boom" so-called, to each city, and its beneficial effects have been reflected throughout the Provinces as a whole. New industries have been attracted, and there has been an expansion of home endeavor. Trade has increased, and the volume of business handled at each port during the winter season has seen an annual enlargement. So much so is this apparent in St. John, that only within the last week, an outside shipping company, the "Red Cross Line" made application for accommodation for a line of steamers between New York and that port, but it was found that there was no berth available so much occupied were the existing harbor accomodations. An effort will, however, be made to provide the line with wharfage.

Real estate has almost trebled in value in both places, within the last two years. The populations are increasing and, of course this may be said regarding many other towns throughout the Atlantic provinces. The people are beginning to take a more active interest in general affairs, and there is more confidence in commercial and industrial endeavor than ever before. The Boards of Trade are earnestly working in the interests of the two ports for the securing of new industries, bettering general civic conditions, increasing the population, and in other ways with the co-operation of the citizens, while working hand-in-hand with the civic governing bodies, are exerting themselves to have Halifax and St. John recognized as modern Liverpools in the world of commerce, trade and industry.

Canadian Cement Co. and St. John, N.B.

Much interest in being evinced in local trade and manufacturing circles over the announcement made by H. L. Doble, of Montreal, comptroller for the Canada Cement Co., that his company intended establishing in or near St. John a million dollar plant having a capacity of 1,000 barrels a day, and employing about 150 men. While nothing definite has been said regarding a site, it is understood that the factory will locate in the vicinity of Model Farm, about ten miles from the city, but still not so far as to prevent the city from reaping the advantage of the plant being there.

Grain Conveyor Contract.

The J. S. Metcalfe Co., Ltd., has been awarded the contract of building the additional grain conveyors at the west side of the harbor for the Government, the approximate cost being about $140,000. It is hoped that the new conveyors will be ready for use this winter, as they are greatly needed to handle the increased trade.

Copper Mining.

Copper mining on an extensive scale may be developed in Kings County, N. B., through the discovery of what is said to be very rich ore at Scotch Settlement. In most places, prospectors have struck the mineral four feet from the surface. A company is to be formed which will mine the area, and establish permanent camps, and it would not be surprising if within a short time an important mining town springs up in the vicinity.

FREDERICTON, N.B.

FREDERICTON, the capital of New Brunswick, the last of the maritime centres visited by the party of Canadian manufacturers, stands on a piece of high intervale on the west bank of the Saint John river, eighty-four miles from its mouth. The site of the city is both picturesque and pretty, and commands a magnificent view of the famous river. In this city of about 10,000 inhabitants, a great deal of manufacturing is carried on, important legislation enacted, and hundreds of students are annually turned out from the leading academical institutions. The most important industries are: The Hartt Boot & Shoe Co., employing 250 hands; the Canadian Cottons, Ltd., 800; the John Palmer Co., Ltd., 150; Palmer-McLellan Co., Ltd., 150; Chestnut Canoe Co., Ltd., 60; Risteen Co., Ltd., 40; M. Ryan & Sons, Ltd., 50; McFarlane, Neill Co., 40; Smith Foundry Co., Ltd., 40 employes, and many other smaller concerns. Fraser, Ltd., lumbermen, operate a large mill, employing about 200, while the York & Sunbury Milling Co., Ltd., and the Babbitt Lumber Co., Ltd., operate smaller lumber mills.

The city enjoys desirable transportation facilities both by rail and water. In addition to an adequate river service, Fredericton is served by the Canadian Pacific and the Intercolonial systems, and enjoys competitive freight rates to Western Canada. The Fredericton and Grand Lake Railway has this month been completed, and will be operated as part of the C.P.R. In addition to opening up a large agricultural district, the railway will also serve to bring the products of the Grand Lake coal mines to Fredericton at a much lower cost.

Power charges in Fredericton are very reasonable, while three new companies have been formed to develop the natural water powers on the Saint John River. Very generous concessions in the way of a free site, free water and exemption from taxation for a definite period of years will be granted by the city to sterling, bona fide industries.

In Fredericton are situated the Parliament and Departmental Buildings, the University of New Brunswick, the Provincial Normal School, the Fredericton High School and the Fredericton Business College, all striking structures of elaborate design.

Building activity in Fredericton continues brisk. Falconer and Macdonald have the work on Fredericton's large new post office well advanced. The Maritime Bridge Co., Ltd., of New Glasgow, who have the contract for the structural steel for the building, have practically completed their contract. The Ryan Construction Co., Ltd., are rushing operations on the erection of the large addition to the Provincial Normal School. The new building for the Royal Bank of Canada is nearing completion, and the Canadian Cottons, Ltd., will commence the operation of their new machinery in the immediate future. The company are desirous of securing additional female help.

On the river front, the Foundation Company, Ltd., are working day and night crews on the re-erection of the large pier of the Fredericton Highway Bridge, while Forbes & Company, Ltd., are building a concrete wharf for the

MURRAY & GREGORY LUMBER MILLS, ST. JOHN, N. B.

Dominion Government in the rear of the City Hall property. Smith, Merrithew & Company, Ltd., have finished their contract on miles six to sixteen north of Fredericton on the Saint John Valley Railway, and have taken contracts for the erection of buildings at the Experimental Station.

AMHERST, N.S.

AMHERST is a bustling manufacturing town in Nova Scotia which, in a score of years, has seen its industries grow from small workshops to great manufacturing plants. In 1900, it had neither a sewerage system nor a paved street. To-day it has both, and its annual exports total over seven million dollars, which represents a production of over $700 per inhabitant.

Among its largest industries are the following:—

The Canadian Car and Foundry Co., with which are included the Rhodes Curry Co., the Malleable Iron Works and the Rolling Mills; occupying about fifty acres of ground. The Amherst branch of this concern differs materially from nearly all other car works on this continent, in that most of them are merely assembling shops. The Amherst branch produces almost everything entering into the construction of the cars built there, and supplies various other car works throughout Canada with parts. The annual output of this company is worth about $3,500,000. The pay-roll amounts to more than $600,000 a year, and from 1,200 to 1,500 men are employed. The Rhodes Curry branch does a business in the Amherst department, of $250,000 yearly.

The Robb Engineering Co., manufacturers of engines, boilers, general machinery, etc., employ 400 men. The annual pay-roll is $250,000, and the output $1,000,000 a year.

The Amherst Foundry Co., manufacturers of enamelware, steam furnaces and ranges, employ 150 men, whose total yearly wages amount to $80,000. The annual output is $300,000.

Six miles from Amherst is situated the village of Chignecto, the headquarters of the Maritime Coal, Railway & Power Co. This is the only place in the world where power is generated at the mouth of the mine and transmitted for manufacturing purposes. When this plant was opened, a telegram of congratulation was received from Thomas A. Edison, on whose suggestion it was built. In this telegram he stated that "he was delighted that the first plant of its kind on the continent should have been erected in the Province in which his father was born."

PRODUCTS OF THE INTERNATIONAL ENGINEERING WORKS, LTD., AMHERST, N.S.

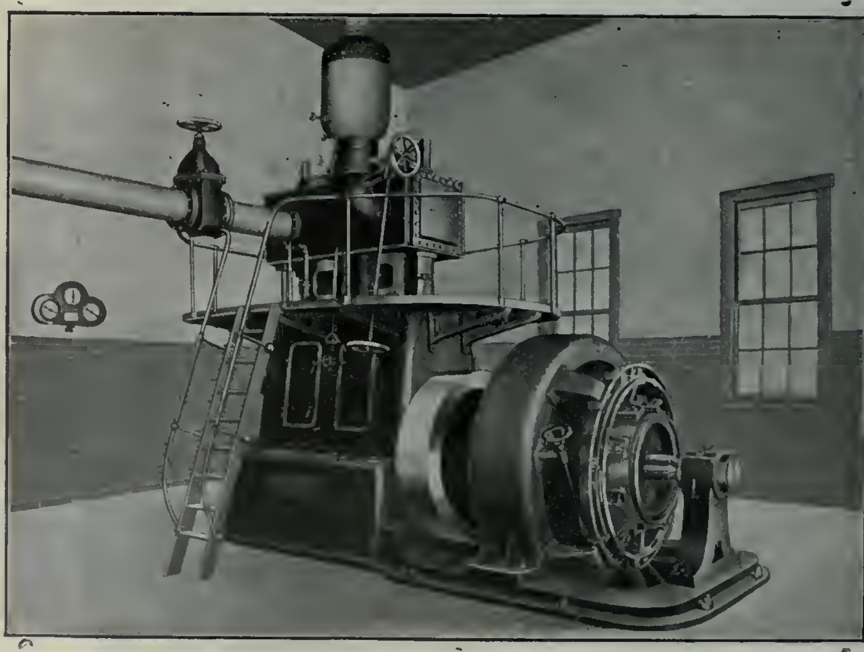
Coal has been an important factor in the development of Amherst. Within a radius of from six to twenty miles from the town are situated some of the best coal-fields of the East. Among the larger coalfields are Springhill, also the mines of the Maritime Coal, Railway & Power Co. at Chignecto and Joggins, as well as Minudie and River Hebert. Many smaller mines are also being developed.

The Maritime Gypsum Co.'s Works are located within three miles of Amherst. Here about 100 men are given steady employment. The company has its own railway and wharves, and shipment of plaster is made direct to New York by steamer. The annual output of plaster is in the vicinity of 75,000 tons, and it is estimated that this property alone is capable of producing 3,000,000 tons of plaster. The works are operated by electrical power supplied by the Maritime Power Co.

ST. JOHN, N.B.

FIVE years ago St. John, New Brunswick, was one of the most conservative cities in Canada. When it was proposed to take up the American idea of city building and progress, the reply was something like this—" That will not do here. We are too conservative." A few of the citizens, however, started a movement, the success of which has surprised even the most optimistic, and today stands as a lesson to other backward-looking cities.

St. John has entered upon a period of industrial expansion of considerable magnitude. So much so that it is attracting outside capital, and local men are taking up projects of large enterprises That the Government and the railways anticipate a great increase in business is evidenced by the many millions of dollars being expended at the present time in building docks, breakwater, grain elevators and conveyors, railway terminals and extension of elec-



PRODUCTS OF THE INTERNATIONAL ENGINEERING WORKS, LTD., AMHERST, N.S.

tric railways. The building of a great hydro-electric plant, bringing natural gas to the city, development of coal and iron areas, will bring many new industries. Courtenay bay will be surrounded with wharves and breakwater, and have one of the largest dry docks in the world.

C.M.A. Greeting.

In the greeting which was extended to the Canadian manufacturers on their recent visit to the Maritime Provinces, the St. John Board of Trade stated:—"St. John is experiencing an era of prosperity and progress not equalled in Eastern Canada, and we want you to see with your own eyes the evidence of the optimistic spirit of the citizens who, with the Dominion Government and railways, are expending $50,000,000 in new developments and improvements, including post office, theatre, banks, armory, sugar refinery, grain elevators and conveyors, industrial plants, warehouses, dry docks, breakwater, wharves, etc. Let us show you."

Industrial Development.

The Atlantic Sugar Refinery Company have well under way the sugar refinery, which is to cost, with equipment, in the neighborhood of $3,000,000. It is to be completed and in operation within a year, turning out 2,000 barrels of sugar a day, and employing 600 men. The Canada Cement Company, realizing that the great demand for cement in the extensive building operations which are under way and projected, will cause a big demand for their product, have decided to build a million dollar plant near the city. The Maritime Motor Car Company have completed an automobile factory, large enough to turn out 1,000 cars a year, and afford employment to a large number of men. The T. S. Simms Company have erected a brush and broom factory. The Canadian Brush Company also recently completed a factory building. T. McAvity & Sons will erect a foundry and machine shop at an estimated cost of $1,000,000. The Partington Pulp and Paper Mills have been building an extension of the C.P.R. tracks to their plant, and have greatly increased the production of their large pulp mills. The Board of Trade have negotiations on with several manufacturers with a view to their establishing another pulp mill, oil refinery and other smaller industries.

Raw Material Feature.

The close proximity of raw materials, geographical position and transportation facilities by both rail and water, are bound to make St. John a great industrial centre. It already has the Canadian Pacific and Intercolonial railways, and within a short time will have the Grand Trunk Pacific and Valley Railways, both of which will have terminals and wharves at St. John.

WORK TRAIN, FREDERICTON AND GRAND LAKE RAILWAY.

HALIFAX, N.S.

HALIFAX is a favorable location for manufacturing successfully. It is situated at a focal point of three important systems of railway with convenient coastal and ocean communications, and has one of the finest harbors in the world. It has steamer communication to all parts of the world, and its assembling advantages of raw material can hardly be surpassed.

At the present time there are some sixty manufacturing industries in the city, a number of them competing successfully for a share of the trade, not only of Western Canada and the American markets, but of those abroad.

The Ideal City.

All roads lead to Halifax. Its advantages as a manufacturing and living point are many. From its geographical position, practically surrounded by water, it has advantages over every province in the Dominion, with one exception, in being able to assemble materials for manufacturing, as water borne freight, which on account of its cheapness, in comparison with other locomotion, gives a very great advantage to the manufacturer. Another great advantage is that Halifax is located centrally in a province that has among its natural products the essentials for manufacturing—a railway haul of 4 hours will place the best Pictou and Cumberland coal, and the vast coal fields of Cape Breton all

CANADIAN SARDINE CO. WORKS, ST. ANDREWS, N.B.

within one hour's run by rail. In the forests are found woods of great variety for the manufacture of furniture and wood work of all kinds. The minerals are abundant and of great variety, the minerals and mineral product of the province last year being valued at $37,000,000.

Steamer Connections.

Halifax has advantages over New York in the matter of distance to other great ports of the world. To Cape Town, South Africa, the distance from Halifax is 4,623 miles as compared with 6,640 miles from New York; to Sydney, New South Wales, it is 12,980 miles from Halifax, against 13,245 miles from New York.

At the present time Halifax has steamship connection with London, Liverpool, Bristol, Manchester, Glasgow, Dublin, Havre, Antwerp, Rotterdam, Libau (Russia), Cape Town, Port Elizabeth, Australia, New Zealand, Cuba, Mexico, West Indies, St. John's (Newfoundland), Jamaica, New York, Boston, Portland, St. John, N.B., Prince Edward Island, and St. Pierre et Miquelon. A very large number of sailing vessels embark and discharge cargoes at Halifax at all seasons of the year.

Halifax also enjoys the advantages of a number of steamboat lines to principal ports in the Maritime Provinces, and the cheap rates in connection with the water borne freight give it a very great advantage as a distributing point. Besides these steamers there are a number of schooner packets—this service constituting an important shipping medium with merchants, especially for heavy goods, and aids materially in preventing freights from becoming unreasonable and exorbitant.

In regard to railway connections, Halifax is the terminus of the Intercolonial Railway, the Dominion Atlantic Railway, the Halifax and South Western Railway, and the Halifax and Eastern Railway, the latter now under construction. It is also the proposed terminus of the Canadian Pacific Railway, the Grand Trunk Pacific Railway, and the Canadian Northern Railway.

Business Openings.

Halifax holds out exceptional advantages for furniture factories, locomotives works, shirt and collar factories, glove, button and hosiery factories, wire fencing, etc., as all materials in connection with the manufacture of these can be assembled probably cheaper than at any other point in the Dominion. There are also splendid openings for market gardening, small fruit culture, the preserved and canned fruit industry, etc.

Halifax boasts certain factories which supply the market for their kind of products, not only in the Maritime Provinces but also in Western Canada. It is the seat of the sugar manufacturing industry of Eastern Canada. The Acadia Refining Co. have now neared the construction at Woodside, on the site of the burned refinery, of a plant that will be the largest in Canada. When this building is completed, the company will have a capacity of 4,200 barrels per day, or practically half the daily consumption of sugar in Canada. It is estimated that the new Woodside buildings and plant, when completed will have cost $3,000,000.

Another of the established industries is the manufacture of paint; branch factories and warehouses are conducted in St. John, New Brunswick, Montreal, P.Q., and Winnipeg, Manitoba.

One of the largest clothing factories in Canada is also situated in Halifax, and a goodly portion of its output is obtained from a cloth mill owned and operated by the firm and situated in the interior of the Province in one of the wool growing sections. One of Canada's largest confectionery and biscuit factories is also situated in the city with a trade extending to the Pacific Coast.

The Nova Scotia Car Works give employment to a large army of men, and is one of the most modern and complete plants of its kind in Canada, having an output of twenty cars a day. A large cotton factory gives employment to some 500 hands.

C.P.R. STEAMSHIP "ST. GEORGE" LEAVING ST. JOHN, N.B., FOR DIGBY, N.S.
This vessel was recently purchased by the C.P.R. from the Great Western Railway Co. of England.

Besides the foregoing, there is a large boot and shoe factory, large wood working mills, three large breweries, machine works, cold storage plant, a large cordage factory and numerous other factories generally found in a commercial centre.

Canadian Seamen to be Rewarded.—For rescuing the master and crew of the American schooner Henry R. Tilton at sea on December 12 last year, Captain James Publicover, of La Have, N.S., will receive a gold watch and Seaman R. Richards a gold medal from the President of the United States. Both rewards have been received by the Canadian Marine Department for presentation.

With the Canadian Manufacturers To and From Halifax

Told by our special correspondent in a few sentences, yet sufficiently indicative of the pleasantries and other experiences of the trip as to stamp this preliminary and sequel to the Annual Convention, with the whole-hearted approval of its participants.

A SPECIAL train pulled out of Montreal station on Sunday night, Sept. 14, bearing 175 Canadian manufacturers bound for the C.M.A. Convention at Halifax. The majority had come from Toronto and Ontario, with just a sprinkling from Montreal and the West.

The train reached St. Andrews, N.B., at noon the following day, where the manufacturers were guests for luncheon at the Algonquin Hotel. Among those who welcomed the visitors were Sir William Van Horne, Mayor King Greenlaw, and the Hon. W. C. H. Grimmer.

After luncheon, a number crossed Passamaquoddy Bay to Eastport, on the steamer St. Andrew's. Others accepted an invitation to Sir Wm. Van Horne's summer home on Minister's Island, where they played golf, bowling and tennis. Some motored to St. Stephens.

For their hospitality, the management of the Algonquin Hotel were thanked as follows: Mr. R. S. Gourlay, president of the C.M.A. spoke in warm terms of St. Andrew's and vicinity; R. D. Fairbairn, Toronto, moved a vote of thanks, and A. R. Clarke, Toronto, said New Brunswick manufacturers were men of the highest type, and bound to make their mark.

At night the party left, passing through St. John, N.B., at three in the morning, and arriving at Truro, N.S., an hour behind time. It was decided not to make any more stop-overs, or the convention might be delayed.

The Tender Jumps Track.

Nevertheless, there was an unavoidable stop-over on the track between Truro and Windsor. While the party were at luncheon, something happened that might have denuded Canada of its leading manufacturers. The tender jumped the track, and it was some time before the engine could be stopped. There was a delay of twenty minutes, but no casualties.

Arrival at Halifax.

The train arrived in Halifax on Tuesday afternoon. At night, Premier Murray and Mayor Bligh welcomed the delegates in the Technical College. F. B. McCurdy, M.P., President of Halifax Board of Trade, was also present. Thomas Cantley, general manager of the Nova Scotia Steel & Coal Co., Ltd., took occasion to criticize strongly the management of the Intercolonial Railway for increasing its freight rates.. He also took advantage of this opportunity to give his fellow-manufacturers a dig in the ribs. He charged them with importing much free steel and getting a duty on the finished products. He was pleased also to take a dig at the Government on the tariff question. The situation of th steel makers, he said, was becoming intolerable.

This ordeal over, Mr. R. S. Gourlay, president of the C.M.A. observed, when returning thanks for the welcome, that the Canadian Manufacturers' Association aimed at the spiritual development as well as the industrial development of the country.

Convention Business.

The first business meeting held by the C.M.A. commenced at the Technical College on Wednesday morning.

At ten o'clock, the president, Mr. R. S. Gourlay, of Toronto, walked on to the platform, accompanied by Mr. G. M. Murray, the general secretary; and Mr. C. B. Gordon, vice-president. The minutes of the previous meeting were considered as read, and the reports of the secretary and treasurer were gone over. The president then delivered his address, at the conclusion of which he was loudly applauded.

NOON HOUR AT THE MACHINE SHOP, INTERNATIONAL ENGINEERING CO., LTD., AMHERST, N.S.

Before adjournment for lunch and during the afternoon session, the reports of standing committees were read, each of which was followed by discussion. The prevention of tobacco smoking and accumulation of rubbish in factories was urged, following the report on insurance.

The report on technical education drew the lengthiest and most interesting discussion. Dr. Mackay, superintendent of education for Nova Scotia, spoke in favor of the scheme as outlined by the Royal Commission.

Mr. A. W. White, of London, Ont., pleaded for the boy in the country, and objected to technical schools being centralized. Vocational education he considered preferable to technical education. Mr. White spoke of the average bachelor of science as being a man who could make a splendid blue print, but his practical education generally ended there. To improve matters he advocated vocational education at an early age. This gentleman went further, and deprecated the system of holding matriculation examination to secure entrance to a technical college. Boys should be eligible, he believed, after passing an examination in lower mathematics.

After Dr. Mackay had assured Mr. White that vocational work was provided for in the report of the Royal Commission, Mr. C. B. Gordon deplored the class of labor available in Canada to-day, and recommended the expenditure of money in the very rudiments of technical education.

Wednesday Afternoon.

At the afternoon session, following the report on Railways and Transportation, Mr. R. O. Fairbairn, of Toronto, read a paper in which he urged the public ownership of some transcontinental railway, preferably the C.N.R.

Mr. S. R. Parsons, chairman of the Transportation Committee, thanked Mr. Fairbairn for his paper, but feared the scheme impracticable. He gave several reasons why.

Mr. E. G. Henderson, of the Canadian Salt Co., Windsor, Ont., who is the new vice-president, threw cold water on the suggestion lavishly. What did the paper propose? And there was no resolution appended. He predicted financial disturbance if such a thing were attempted.

Reading the Tariff Report.

By the time the report of the Tariff Committee was ready for reading, manufacturers were somewhat of a rarity in the technical college. It was getting late, and many of the delegates had wives and daughters who were outside enjoying themselves.

Mr. A. Saunders, of Goderich, suggested that the tariff report, being important, should be held over until the following morning. Mr. Thomas Cantley, general manager of the Nova Scotia Coal & Steel Co., while appreciating the delivery and elocution of those who read the reports, thought the reading rather childish, as all had copies of the report in their hands.

As a compromise, only the important points in the tariff report were read. The suggestion was then made that the tariff points be discussed by groups of manufacturers interested before referring them to Ottawa. Mr. Gourlay thought this excellent.

GEORGE BOOTH,
Treasurer Canadian Manufacturers' Association.

At the Wednesday evening session changes in by-laws were discussed, including one to make the date of the annual meeting earlier, to appoint an executive committee, to eliminate Provincial vice-presidents from the list of officers, etc.

Thursday Morning.

The report of the parliamentary committee was read at the opening of the Thursday session, following which a motion for the appointment of a special committee on the Bankruptcy Act was passed, after much opposition.

Mr. White of London, took part in a discussion during which the statement was made that the credential sales legislation in Alberta tended to encourage crooks. President Gourlay said the association would work hand in hand with the agriculturists.

The Western Grain Growers having sent a letter to the meeting requesting the help of the Association in securing British preferential tariff, Mr. Gourlay, president, wired that they were always willing to confer with them on matters of mutual concern.

The enormous damage done by fires in the Dominion was the subject of one discussion, and the incoming insurance committee were asked to do their best to awaken members to sense of the danger of fire.

Election of Officers.

During the morning, the following officers were elected for the coming year:—President, C. B. Gordon, Montreal; first vice-president, E. G. Henderson, Windsor, Ont.; second vice-president, J. H. Sherrard, Montreal; treasurer, George Booth, Toronto; auditor, Wilton C. Eddis & Sons, Toronto. Chairmen of Committees: Tariff, H. H. Champ, Hamilton; transportation, S. R. Parsons, Toronto; legislation, Thomas Findlay, Toronto; membership, N. A. Howie, Toronto; insurance, H. W. Fleury, Aurora, Ont.; technical education, H. H. Mason, Toronto; workmen's compensation, P. W. Ellis, Toronto.

Thursday Evening.

Following an excursion around the harbor in the afternoon, the delegates wound up their business in Halifax with a banquet in the Halifax Hotel, at which Premier Borden, Premier Murray and Mr. C. B. Gordon, the newly elected president, were the principal speakers. Mr. Borden's speech lasted for twenty minutes. He avoided politics throughout, his remarks being mainly based on the rich resources of Nova Scotia and Canada.

Mr. Gordon went deeply into the tariff situation. While not advocating a general revision of the tariff, there were several discrepancies which called for the immediate attention of the Government, chiefly concerning iron and steel. Protection, he argued, was given to this industry with one hand, and taken away with the other.

He did not think this schedule called for any adjustment that would cost the consumer a penny, but rather required internal adjustment, so that the rates would fall on the different manufactures of iron and steel, where they would afford proper protection to the amount of capital invested in the steel business.

The banquet closed at midnight so as to allow the delegates to catch a train which departed from Halifax at two o'clock.

Friday Morning.

Early Friday morning the long train carrying the manufacturers, drew into the depot at New Glasgow, N.S. The party were taken in autos to the plant of the Nova Scotia Steel and Coal Co., at Trenton. Two hours were spent in the works, Mr. Thomas Cantley, the general manager, with a large staff, escorting the visitors around. From the steel works they went to the new plant of the Eastern Car Co.

Another plant visited was that of the Standard Clay Products. Cars were placed at the disposal of the party by the Pictou County Electric Co.

The Mayor of New Glasgow, speaking to the party later, stated that if any of the Ontario manufacturers were contemplating a change of location, they should go to New Glasgow. The party was cheered as the train drew out.

Amherst, N.S., was reached at 2.30 Friday afternoon where they were welcomed by a committee which included George T. Douglas of the Canadian Car and Foundry Co.

Seventy-five motor cars were required to carry the visitors and citizens through the town. A visit was made to the plant of the Canadian Car and Foundry Co. On the return journey a visit was paid on Saturday to St. John, N.B., and later in the day to Fredericton, leaving at 10 p.m. The party reached Toronto on Sunday night.

C.M.A. CONVENTION NOTES.

THE manufacturers held a smoker and concert after their Wednesday evening session. The music was appropriate. There were three songs: "Boys of the Old Brigade," "The Veteran's Song," and "Go to Sea." Over two hundred were present.

Several amendments to the by-laws of the Association were adopted.

Toronto sent the largest contingent of manufacturers to the convention.

On Wednesday evening the delegates were given a moonlight sail in Halifax harbor.

It was decided this year to spend $1,000 on scholarships for research work in the universities and colleges.

At the close of the Convention about a dozen votes of thanks were passed to various parties for kindness shown.

Dundas was represented by Henry Bertram of John Bertram & Sons, the well-known manufacturers of machine tools.

Winnipeg put in strong claims for the convention to be held there in 1914. The matter was referred to the Executive Committee.

One of the Halifax papers referred to Mr. G. M. Murray as the grand secretary of the Canadian Manufacturers' Association.

The Technical College, where the manufacturers conducted their business, is the first state-owned institution of its kind in America.

Mayor Bligh spoke blithely of Halifax weather until Thursday afternoon, when rain was sent as an accompaniment to a harbor excursion.

Prior to the arrival of the delegates at Halifax, the Nova Scotia branch of the C.M.A. held their annual meeting for the election of officers.

Mr. G. M. Murray, general secretary of the C.M.A. in his report, stated that a new "trade index" costing $10,000 was being brought out.

On their return visit to St. John, N. B., the delegates were shown around the huge Atlantic Sugar Refining plant, which is nearing completion.

The Royal Canadian Regiment gave a concert in the public gardens on Wednesday afternoon, when special favors were accorded the C.M.A. delegates.

Many of the delegates from Central and Western Canada were unable to secure accommodation on the eleven-car special train from Montreal, and came by regular trains.

Mrs. McLaughlin, wife of R. S. McLaughlin, of the McLaughlin Motor Car Co., Oshawa, Ont., won a pin of tourmaline and pearls at a whist party held at the Waegwoltic Club.

At the reception given to the delegates on Tuesday night, a late start was made owing to the train being behind time. Fortunately all the speeches were of pleasing length.

On the walls of the Technical College where the meetings were held, were pictures of the most prominent factories in Nova Scotia, while near the platform were samples of grains and fruit.

Mayor Bligh of Halifax, in his welcome to the delegates, stated that he had instructed the police to give the visitors liberty of action, so that they might enjoy themselves in their own way.

During the Wednesday morning session, President Gourlay announced the extension of privileges to visiting members of the C.M.A., by the Halifax and other city clubs, as well as by the Halifax Golf Club.

Mrs. W. R. Dunn, wife of W. R. Dunn of the International Harvester Co., Ltd., Hamilton, won a necklace of oxydized silver and enamel, set with moonstones, at a whist party held at the Waegwoltic Club on Wednesday night.

A large percentage of those attending the convention were manufacturers of iron and steel or metal goods, and therefore readers of "Canadian Machinery." Practically all those from Hamilton were connected with the steel and subsidiary trades.

Mayor Bligh in welcoming the C.M. A. reminded the delegates that Halifax was the gate of Canada. Mr. Gourlay in reply, stated that it was not enough to be a gateway. They must look back of the gateway to the power which held the people after they came.

SOCIAL SIDE OF THE C.M.A. CONVENTION.

SCORES of manufacturers took their wives to the Convention at Halifax. Many took their daughters. Few took their sons. As ladies are not much interested in grain growers, workmen's compensation, and tariffs, it was necessary to find something for them to do during the two days spent in the Nova Scotian capital. At ten o'clock on Wednesday morning the party were conveyed in automobiles to Bedford, Waverley, and Dartmouth, returning to the hotels at noon for luncheon.

In the afternoon there was a band concert in the Gardens, at which the blue and white ribbon of the C.M.A. visitors was conspicuous. Music was provided by the R.C.R. band. The ladies were later received at the Woman's Council House, the hostesses being Mrs. William Dennis, president of the local council, Mrs. J. C. Mackintosh, ex-president, and others.

In the evening the Waegwoltic grounds had been transferred into a fairyland with electric lights. At the club house a whist party was held. Some however, preferred the water. Supper was served in the cafe, where the Academy orchestra rendered a musical programme.

After the banquet on Thursday night, the visiting manufacturers, ladies, and officials, proceeded to North Street where they gave a dance, which was attended by a number of Halifax people. A Canadian Pacific dining car had been cleared of its tables and fitted up as a miniature ball room, where there was dancing for an hour or so to the music of an orchestra. It was a jolly affair.

Harbor Excursion.

Prior to the banquet, the manufacturers and ladies were taken for a sail in the harbor. Rain fell, but it scarcely marred the pleasures of the day. The decks of the "Lady Laurier" were covered with awnings, and comfortable accommodations were provided for all the guests.

The Lady Laurier left the Plant wharf shortly before three o'clock, going northwards almost to the narrows before swinging around for the sail down the harbor and up the Arm. Somebody said that it seemed almost as if they had one meal each day, but that occupied the whole day, for every affair planned for them included something to eat.

On the return trip, the "Cornwall" was alive with sailors waving and cheering. The passengers on the Lady Laurier returned the greeting; three cheers and a tiger were given for the British Navy, and the band aboard the excursion boat played "Rule Britannia."

Development of the Nova Scotia Steel and Coal Co., Ltd.

An article showing briefly how one of the largest steel companies in Canada grew from a little forge shop to its present gigantic proportions, and which is specially a propos in view of the recent visit of Canadian manufacturers to Halifax, a city which has participated in the growth resulting from the establishment of industries like Scotia in the Maritime Provinces.

HALIFAX may have its manufactures, but none will compare with the gigantic iron and steel industries in the north of the province, to wit, the Nova Scotia Steel and Coal Co., of New Glasgow, and the Dominion Iron and Steel Co., of Sydney. These contributed to make the Convention of the C. M. A. in Halifax, a more impressive function, without them, the subsidiary industries scattered throughout the province would be considerably crippled. To manage these plants, big men are needed, and these brought their influence to bear on the doings of the Convention.

The history of the first of these corporations is summed up in the simple facts that in 1872 it employed 10 men, whereas 6,500 are now employed. In the first year, its capital was $4,000; it is now $13,000,000. It operates its own iron ore mines in Wabana, Nfld., and exports large quantities to Europe. It owns immense collieries, operates blast and open hearth furnaces, and produces a great variety of products, from nails to huge forgings.

The Growth of Scotia.

Thirty-eight years ago the Hope Iron Works began business in New Glasgow, with a capital of four thousand dollars and eight or ten employees. Its main product was iron ship's knees. Less than four decades has seen the little forge shop expand into this big concern. In place of the primitive steam helve hammer with wooden beam, which was its first piece of equipment, the company to-day manufactures the basic elements into the most highly finished products, carries on extensive lumbering operations, and operates two lines of railway and a fleet of twenty steamers.

The development of "Scotia," as the Nova Scotia Steel and Coal Company is familiarly known, into its present important industrial position has been a steady record of perseverance and progress. It has been built up solely by Nova Scotian brains, and, to a great extent, by provincial capital, and, by its growth, has paved the way for the development of steel making in the Dominion. "Scotia" was the first company on this continent to wash coal in a commercial way, and was also the first company to make coke in retort ovens. It made the first steel ingots produced in the Dominion. It was largely responsible for the industrial development of the province by demonstrating that Cape Breton coal could be used for iron and steel making. It discovered and opened up the world-famous iron ore deposits of Wabana, and recently has again done pioneer work there by developing the submarine areas lying under Conception Bay, proving that these deposits contain hundreds of millions of tons of high class ore. Had these problems not been solved when they were, the iron and steel industry of Nova Scotia would not occupy the position it does to-day.

Much of the success that has attended the Nova Scotia Steel and Coal Company has been due to the varied nature of its product. It has three separate and independent businesses; mining iron ore, mining coal and producing iron, steel and finished steel products. This trinity of resources has resulted in the company being able to weather periods of financial depression with less inconvenience than other concerns, for experience has shown that the depressions which visit the business world in regular cycles seldom or never affect all these three industries to the same extent.

But far more important than this is the strength that the company derives from controlling all the elements that enter into the manufacture of steel. Producing its own ore, coal and limestone, and operating its own iron and steel making plants and finishing mills, it is completely independent of all other sources of supply. The operations of the company are principally conducted at three different points: Wabana, in Newfoundland, where it mines and ships iron ore; Sydney Mines, Cape Breton, where it operates five coal mines, a blast furnace, open hearth furnaces and extensive repair shops; and New Glasgow, where are located the head offices, forges and finishing mills of the company. Subsidiary lumbering operations are carried on at Gander Bay, Nfld., and Bridgeville, in Pictou county, and the company also operates an extensive limestone quarry at Point Edward, C.B.

Early History of the Company.

For six years after its foundation, the Hope Iron Works continued in business at its original location in the centre of New Glasgow. Then its name was changed to the Nova Scotia Forge Co., and the works were removed to a point two miles down the East River, then locally known as Smelt Brook, now Trenton, or North New Glasgow. In 1882 it was decided to manufacture steel, and the proprietors of the Forge Company

NEW GLASGOW PLANT, THE NOVA SCOTIA STEEL & COAL CO.

organized another company called the Nova Scotia Steel Co. This company began to make steel from imported pig iron and scrap steel by the Siemens-Martin open hearth process, and in 1883 produced the first steel ingots made in Canada. In 1889 the two companies amalgamated under the name of the Nova Scotia Steel and Forge Company.

During this time, the works had been steadily expanding. The Forge Company early began making railway car axles, and on moving to Trenton, an extensive engineering shop was installed. The first cogging mill in the Dominion was installed by the Company in 1882, and a plate mill and a 9 inch mill were added shortly afterwards. In 1891 a combined 16 inch and 9 inch mill was installed, and numerous additions and improvements have been made to this part of the company's business since.

In 1890 some of the leading shareholders in the Nova Scotia Steel and Forge Company organized the New Glasgow Iron, Coal and Railway Company with a capital of one million dollars. This company purchased extensive iron ore lands on the East River of Pictou and elsewhere, built a line of railway from Ferrona Junction on the Intercolonial to Sunny Brae, and also built a large coal washing plant, retort coke ovens and a modern blast furnace at Ferrona, seven miles from New Glasgow. The blast furnace was blown in during 1892. The coal washing plant in connection with this furnace was the first modern washer of its kind in America.

Two years later, the New Glasgow Iron, Coal and Railway Co., acquired the new famous iron ore deposits at Belle Isle, Conception Bay, Newfoundland, and added a new name, Wabana, to the list of the world's shipping ports. The mines were opened up, a double track, wire rope haulage system was built, machinery for operating it installed, storage pockets and a pier constructed, and on Christmas Day, 1895, the first shipment of Wabana ore was made by steamer. Since that time more than seven million tons of ore have been shipped, and over 1,500 steamers have loaded and discharged at this port without loss or damage of any kind or a claim being made for a farthing of insurance, a record which is believed to be unique in sea transport.

In 1895 the New Glasgow Iron, Coal and Railway Co. and the Nova Scotia Steel and Forge Co., both largely owned by the same people, were amalgamated, taking again the old name of the Nova Scotia Steel Co. Wabana ore was shipped to Pictou and used in the furnace at Ferrona with good results, and the company continued to make steady progress for a number of years. Ever in the minds of the management was the idea of an even bigger industry, a corporation which should be truly national in scope, and which should control all the basic products required for a great steel industry.

To carry out this policy, the company decided to acquire the General Mining Association's coal mines at Sydney Mines and establish an iron and steel plant at that point. Sydney Mines offered better facilities for iron making than Ferrona, for the ore could be landed there much cheaper, and the company would have its own coal supply at the furnace doors. In 1900, Mr. Thomas Cantley, the present general manager of the Nova Scotia Steel and Coal Company was sent to London with very full powers of attorney as representative of the company, and after protracted negotiations succeeded in purchasing all the vast coal areas and all the other property of the General Mining Association, securing for "Scotia" an unlimited supply of the very best quality of metallurgical coal.

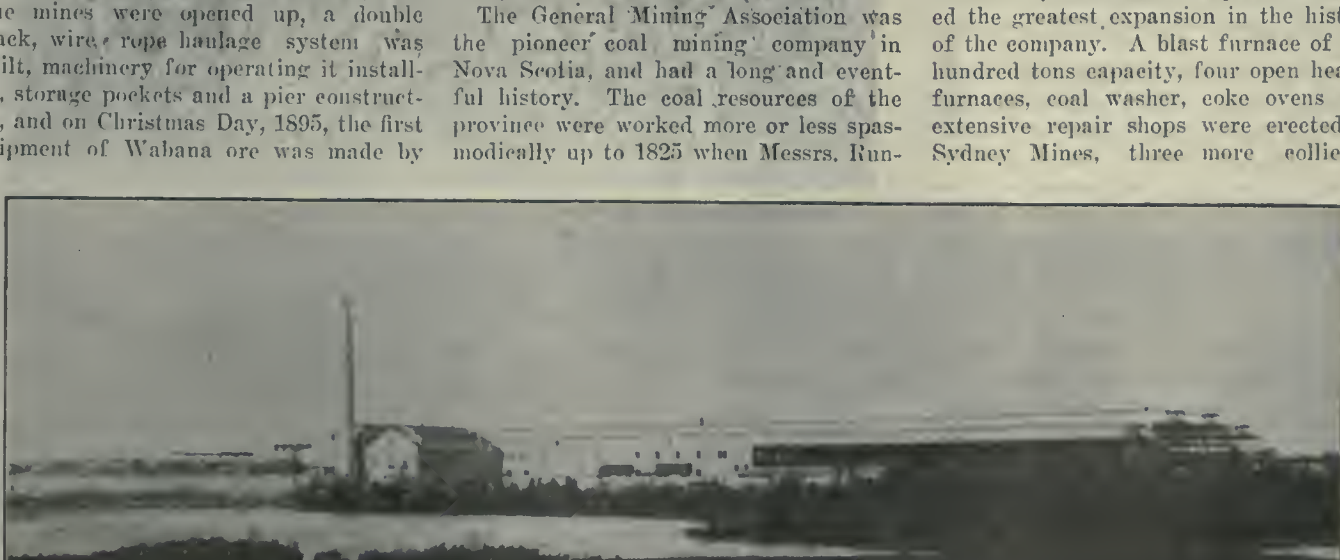
General Mining Association.

The General Mining Association was the pioneer coal mining company in Nova Scotia, and had a long and eventful history. The coal resources of the province were worked more or less spasmodically up to 1825 when Messrs. Rundall, Bridge and Rundall, of London, organized this concern. It acquired a lease of all the coal seams in the province from the Duke of York, who held a lease of all the minerals in Nova Scotia by the royal prerogative of George IV. Operations were begun shortly afterwards under the direction of Mr. Richard Brown, an eminent mining engineer and geologist who was sent out from England to manage the company's affairs, and during the seventy-five years of its existence, the company had but two general managers, Mr. Brown and his son, Mr. Richard H. Brown, who succeeded his father in 1864, and continued in the management of the company until it went out of existence.

The first shaft was sunk in 1830 at what was known as the yard pit. It was 200 feet deep. A second shaft, 320 feet deep, was sunk four years later, called the Jacob's Pit. This shaft tapped the now famous "Old Sydney" seam. In this year a railway was built from the pits to a shipping place at North Sydney. A third shaft was sunk on the Old Sydney seam in 1854 at a depth of 400 feet. In 1864, the first steam hammer used in the province was imported and erected at Sydney Mines. In the following year another colliery was opened by Hope on the Lloyd's Cove seam at Sydney Mines. The company continued making steady progress from that time on, but there were no very striking events in its history. In 1886, the first locomotive ever built in the province was constructed at Sydney Mines, and then in 1900 the G. M. A. passed into history, and in its place came the present corporation, the Nova Scotia Steel and Coal Co.

Sydney Mines Properties.

Probably the next few years witnessed the greatest expansion in the history of the company. A blast furnace of two hundred tons capacity, four open hearth furnaces, coal washer, coke ovens and extensive repair shops were erected at Sydney Mines, three more collieries



EASTERN CAR CO. PLANT, NEW GLASGOW, NOVA SCOTIA.

were sunk on the coal measures there, and the Queen pit, which had been closed some years before, was re-opened as Sydney No. 5.

The blast furnace was blown in during September, 1904. It was designed by Messrs. F. C. Roberts & Co., Philadelphia, and is 85 feet high. There are four stoves of the Cowper type, each twelve feet in diameter and eighty-five feet high, and two blowing engines with air cylinders 72 inches in diameter, with 60 inch stroke, of the Southwark latest type, supplied with steam by Stirling water tube boilers fired with the furnace waste gases. One feature of the entire equipment at Sydney Mines is that the waste gases of the blast furnaces and coke ovens are all used for fuel, and every effort is made to reduce the consumption of coal on the plant as much as possible.

The blast furnace is fed by an inclined skip hoist supplied with coke, ore and limestone supplied by a modern storage bin system. Air at a temperature of about 1,300 degrees is forced through the furnace by two big compound blowing engines, ensuring a rapid consumption of the coke, ore and limestone to a molten mass. The iron, being heavier than the impurities contained in the mixture, sinks to the bottom of the furnace and is drawn off at intervals of three or four hours. Still in a molten condition, it is conveyed to the open hearth furnaces to be converted into steel, and the slag is then removed.

The Coke Ovens.

The coke for the furnace is produced in four batteries of coke ovens, 150 in all, of the retort type. These ovens are charged from buggies running on top, and the coke is pushed out of the ovens by electrically operated pushers. The waste gases are used to generate steam for the power plant. At the washer of No. 1 colliery, screened slack coal is washed to remove the sulphur, ash and slate.

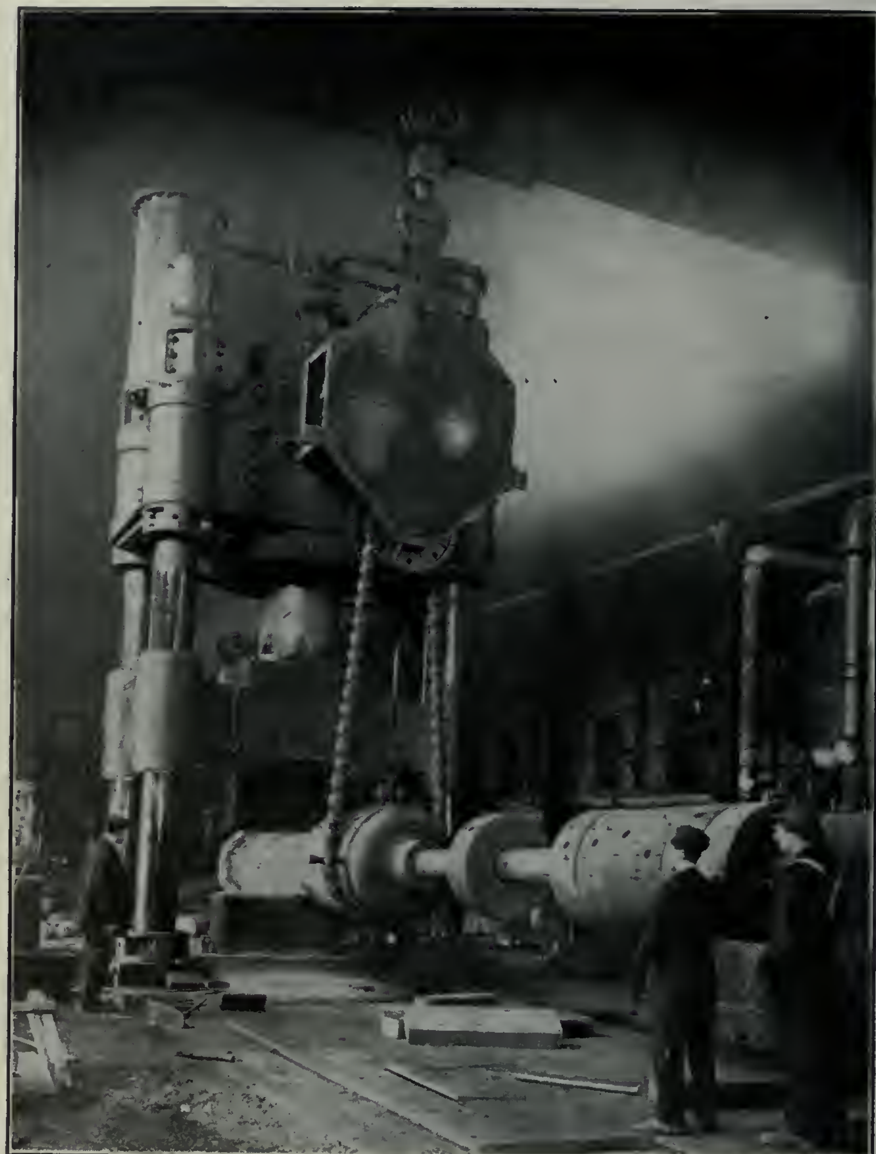
The open hearth department consists of three 50 ton, basic furnaces of modern type and one tilting hot metal mixer with a capacity of 180 tons. In these furnaces, the iron is converted into steel by the removal of the silicon, carbon, phosporous and sulphur. Gas, at a high temperature, is drawn through the furnaces, heating the liquid contents to a much greater degree than in the blast furnace. Under this fierce heat some of the impurities in the iron are burned out, some are carried off in the gas, and the remainder are taken up by the slag. After chemical and physical tests of samples taken from the furnace show that the impurities are eliminated, the furnace is "tapped," the steel being drawn off into "ingot molds." It is allowed to cool, then the mould is removed and the ingot is ready for shipment to the mills.

Coal Mining Machinery.

Two of the collieries, No. 1 and No. 5, are hand pick mines. In the other mines the coal is cut by machines. In No. 1, the oldest colliery, all the coal is now being extracted from submarine workings, and these workings now extend nearly two miles under the sea. These collieries are equipped with all the latest machinery and are among the most important coal producers in the province. From 2,500 to 3,000 men are employed in and about them. The number of employees in the iron and steel departments at Sydney Mines is over seven hundred, and the total yearly wage bill amounts to over two million dollars.

The Plant at New Glasgow.

All the company's crude iron and steel is now produced at Sydney Mines, the manufacturing departments, finishing mills, forges and machine shops being concentrated at New Glasgow. Employing upwards of nine hundred men, the Scotia works at New Glasgow are easily the most important industry of that town. To this point are brought the steel ingots produced at the open hearth furnaces in Sydney Mines to be converted into a great variety of finished steel products. The ingots are first re-heated in two large continuous furnaces, after which they are cogged down on a compound 26 inch reversing mill to the various sizes and shapes required for further manufacture. Then the billets pass along to the various finishing mills. There are four of these mills, consisting of one 20 inch 3-high plate mill, one 18 inch 3-high mill, and two 9 inch 3-high mills. On them are rolled plates up to 50 inches wide and from twelve B. W. G. to ¾ inches thick; mine and tram rails, from twelve to forty pounds per yard; angles from ⅞ x ⅞



4,000 TON STEAM HYDRAULIC PRESS, NOVA SCOTIA STEEL & COAL CO.

inches to 5 x 5 inches, round bars from 5-16 inch to 4 inch; flat bars from 3/8 to 1 inch wide; fish plates, angle bars, tie plates and various shapes used by the agricultural implement manufacturers and car builders of the Dominion. A very considerable portion of the product of these mills is further manufactured at the New Glasgow works.

In the spike department are two automatic machines, capable of turning out twenty-five tons of finished railway spikes per day. Other products of the company are machinery steel, polished shafting, track bolts and nuts, boiler and structural steel rivets, etc. A new building has been erected in which the spike, bolt and nut, and polished shafting departments are located. More machinery will be added to these departments and their output very largely increased.

The Forge Shop.

At the forge shop, marine, machinery and railway forgings of iron and steel up to fifteen tons in weight are produced. The forgings are principally made from large flask ingots cast in Sydney Mines, and are brought by rail to New Glasgow. In the axle shop are the best and most modern devices for manufacturing car axles to be found in the Dominion. There are no works of the same capacity on the continent of Europe. The billets from which the axles are hammered are heated in a large continuous furnace, and are then hammered by two large upright axle hammers to the shape and size required. In connection with the New Glasgow works are large carpenter, pattern and wood working shops, also machine and structural steel shops, where a great deal of the equipment required for the company's ore and coal mines is made.

New Equipment Added.

To provide further power last year there was installed in the main power house a turbine-driven 760 k.w., a.c. generator, and an addition to the open hearth equipment was the fitting of Blair water-cooled ports to the third furnace. All are now fitted with these ports.

An important addition was made to the plant by the installation of hydraulic presses for the fluid compression of steel ingots by the Harmet patent process. This includes one group of presses of 1,200 tons, and one single ingot press of 4,000 tons. The group press can deal with four ingots at a time, and these may be either 3½ or 5 tons each, the press being fitted for either size of mold. The large 4,000 ton single press is equipped for pressing large single forging ingots weighing up to 25 tons. Both presses are fitted with hydraulic pumps and all necessary and accessory equipment.

A new Alliance ingot stripping and loading crane was installed for the stripping of ingots, and handling of ingot molds. This machine has proved to be very efficient and, combined with the fleet of ingot casting and transfer cars, has resulted in considerable economy in this development.

New Glasgow Plant.

The new cogging mill was installed during last summer, and, if called upon, can deal with a considerable increase of output.

The new forge plant at New Glasgow has been completed. This includes the erection of the new hydraulic forging plant. The output from this plant for the last three months of 1912 was greater than that of the old plant for the whole of the previous year.

The new machine roughing shop in connection with the forge plant has been equipped with four new lathes, two modern motor-driven horizontal and one vertical boring mills, a heavy Lancaster drive planer, and centering machine, etc., all electrically driven. The axle-forge and finishing shops were in full operation throughout the whole year, and from these were shipped 43,764 axles, totalling 14,127 tons in weight. To this plant there was added, during the year, one cutting-off machine and one axle-turning lathe.

Other additions to plant include, in the spike department, a new automatic spike machine with capacity of one ton of finished spikes per hour, and the installation of an electrically controlled centrifugal hydraulic pump driven by a low-pressure steam-turbine, with accessory condensing plant, etc. This pump supplies water for all high-pressure hydraulic purposes on the plant.

New Rivet and Bolt Plant.

Progress has been made with the new rivet, bolt and nut plant, which includes all the necessary machines for the manufacture of rivets for boiler and structural work, track and machine bolts, and a large range of square and hexagon nuts. The several machines and heating furnaces are located on an elevated ferro-concrete platform in the manufacturing building; openings in the platform permit the rivets, bolts and nuts as they are forged, to drop to the floor underneath, where, after cooling, they are treated, tapped, or otherwise finished for shipment on cars on the adjacent railway siding.

For general repair work to this plant, as well as for the making of dies, a machine shop was outfitted, and is located in the same building. Its equipment includes the necessary lathes, grinding machines, cold saws, drill presses, milling machines, etc., each of which are operated by individual motor drive. A portion of this building is also used as a smith shop, with apparatus for all small forging and annealing work required in conjunction with this class of work.

Eastern Car Company.

During last summer the Eastern Car Co., Ltd., was organised, being a subsidiary company for the manufacture of steel railway cars. The plant of the Car Company is situated on a plot of 68 acres, adjoining the mills and plant of the Nova Scotia Steel and Coal Co., Ltd., at New Glasgow, having on one side the tracks of Intercolonial Railway, and on the other the tidal waters of Pictou Harbor. The plant is now in operation. The Car Company is a large user of the finished products of the Nova Scotia Steel and Coal Co.

Output and Wages.

The total quantity of ore mined at Wabana last year was 555,000 tons, while of coal the total quantity mined was 841,528 tons, an increase of more than 60,000 odd tons over the previous year. The other outputs were:—

	Tons.
Coke made	85,334
Limestone and dolomite quarried	66,315
Pig iron made	68,784
Steel ingots made at Sydney Mines	77,940
Steel billets rolled at New Glasgow	71,284
Total shipments of finished steel forgings, etc., from New Glasgow works	77,037

For the year 1912 the sum of $3,188,569.87 was paid in wages, distributed as follows:—

For labour in connection with mines and collieries	$2,006,689.30
Iron, steel and coke departments, Sydney mines	515,233.30
At New Glasgow Works ..	666,647.27

The average number of men employed throughout the year was over 5,600, there being employed:

At Sydney Mines Collieries	2,701
At Iron and Steel Department, Sydney Mines	910
At New Glasgow	1,084
At Wabana	951

The total amount expended on capital account during the year at Wabana, Sydney Mines, New Glasgow, and elsewhere, was $1,279,569.00.

The offices are:—Mr. R. E. Harris, K.C., president; Hon. J. D. MacGregor, first vice-president; Thomas Cantley, second vice-president, with R. E. Harris, K.C.; J. D. MacGregor, R. E. Chambers, G. F. McKay, Jas. C. MacGregor, and Thomas Cantley, Executive Committee.

INTERCOLONIAL RAILWAY REORGANIZATION.

A GENERAL reorganization of the Intercolonial Railway was announced by Mr. F. P. Gutelius, general manager of the Government railway system, in a recent interview. The programme will include the creation of two new departments, the double tracking of several sections of the road, increasing yard and shop facilities at several points, improved ferry service at the Strait of Canso, installation of a telephone despatching system on the St. John-Moncton section, when the automatic block system will also be introduced, and a general overhauling of station property, as well as the construction of several new and attractive station houses, including one at Truro which will rank among the finest in the Dominion.

The New Departments.

In connection with the two new departments which are being created, the names of the officials were also announced. Mr. Robert Simpson has been appointed general fuel agent, and Mr. B. K. Kluck becomes general tie agent. The creation of these departments is expected to bring a greater degree of efficiency to the general system, the new men being experienced in the work for which they have been chosen. Mr. Kluck, the new tie inspector, has occupied a like position at St. John, N.B., for the C.P.R. for over three years.

Mr. Robert Simpson, the newly appointed general fuel agent, who has been on the I.C.R. for the past twenty years, is a graduate of the Royal Military College, and was special engineer for Mr. David Pottinger for many years. The work of these two positions was formerly scattered over several departments and a great improvement is looked for in the new system, which comes into effect in a few days.

Speaking particularly of the fuel department, Mr. Gutelius stated that they were now paying from forty to fifty cents more a ton for their coal than eighteen months ago. The value of the appointment of a fuel superintendent, he said, would be in the fact that a closer inspection would be possible, assuring a better grade of coal and more economical handling. He also felt that the advantages to be derived from the appointment of a general tie agent would be about the same, as in future ties will be delivered where they are required and in the quantity required.

Look After Own Repairs.

As regards the reorganization now going on along the line of shops, the general manager said that when all the shops were fully manned they would have a sufficient force to look after repairs of cars and locomotives. They had now about a thousand men at work in the Moncton shops, but it had been concluded that it did not pay to make an absolute concentration of the system's mechanical force at headquarters. They had shops at Chaudiere Junction, at River du Loup, at Stellarton and at Halifax, where repairs could be carried on with economy and despatch. In fact, he said, they had put on fifty additional men at River du Loup quite recently, but of course all the boiler repairs had yet to be done at Moncton.

Double-tracking Contract.

The additional double tracking of the line was going forward at congested points. The general manager stated that a contract had been given out to Soper & McDougall for the double tracking of eight miles of road from Levis to Chaudiere Junction, while the yards at Levis were also to be extended to about double their present size.

Another step forward was being taken down east in order to secure quicker transportation across the Strait of Canso. Canadian shipbuilders had been asked to tender on a second ferry boat for the Canso crossing, the expenditure on this alone amounting to about $300,000. The old ferry, he said, had done splendid service, but a duplicate boat was necessary, and this would, it was hoped, be secured in the near future.

Train Dispatching.

An important feature, according to Mr. Gutelius, will be the train dispatching of the St. John and Moncton section by telephone, tenders now being invited for two copper wires with telephones in the dispatcher's office and in each station along the line between the points mentioned. This will be the first attempt at train dispatching by telephone on the Government System, but the results obtained by Mr. Gutelius on the Lake Superior section of the C.P.R. convinced him that a like system will be successful on the I.C.R. The automatic block system would, he said, be introduced at the same time.

New Stations.

The stations along the I.C.R. are also, he says, being generally overhauled, while very fine structures are being built at Bathurst and Sussex in New Brunswick, and at Truro in Nova Scotia. The last named will be one of the finest station buildings in the Dominion.

The grade revision of the entire system, as promised when Mr. Gutelius took charge of the road, will be started on the Cape Breton section of the road as soon as authority for the expenditure will have been obtained from Parliament, while the surveys are about completed for the change between River du Loup and St. Flavie where the grades are heavy. Engineers are, in fact, going over the whole system, and in good time better grades and curves will be secured.

Traffic in both passenger and freight department, says Mr. Gutelius, is very heavy and constantly on the increase.

BONUSING INDUSTRIES.

AT one of the sessions of the Convention of the Associated Boards of Trade of Western Canada, which met recently at Winnipeg, the bonusing of industries was lengthily and heatedly discussed. The discussion was on a resolution of Mr. D. Y. Leslie, Swift Current, Sask., to the effect that the time had come when legislative restrictions upon the bonusing of industries in the West should be enforced and supplemented. In introducing the motion, Mr. Leslie gave a number of instances of the abuses of the bonusing method, and stated that the practice was becoming so serious as to jeopardize the future of cities and towns concerned.

Favor Bonusing.

Representatives from Fort William, Medicine Hat and Prince Albert opposed the resolution, and endeavored to show that the system could be made a sound and paying investment. Mr. W. B. Wilcox, of Medicine Hat, said that that city had granted in concessions to industries, during the last eighteen months, 137 acres of land, which, with all other concessions, had cost $150,000. These industries, when completed, and in full running order, in accordance with the contracts signed with the city, would employ 1,850 men.

Experience had shown them in the natural gas department of Medicine Hat that in selling gas for domestic purposes at 13½ cents per thousand, and at 5 cents for manufacturing purposes, the city realizes a net revenue of $5 per annum for each head of population, and this increase, due to the coming of the industries spoken of, meant $50,000 per annum, or that the total cost to the city would be paid back in gas revenue alone every three years. The resolution was lost.

LIQUID ALUMINUM.

ACCORDING to German journals, experiments made to bring aluminum to a liquid condition, so that it may be spread when cold over any dry surface, have been successful. The composition is applied like paint with a brush, and looks, when spread, like a dull silver coating. It is said to be an excellent preventive of rust, to be resistant to heat, elastic, durable, and resistant to atmospheric influences, and to form an excellent substitute for tin in plating.

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Vol. X.   SEPTEMBER 25, 1913   No. 13

PRINCIPAL CONTENTS.

THE C.M.A. CONVENTION AT HALIFAX, N.S.

THE editorial pages in this issue of Canadian Machinery have been given over to a more than usually extended account of the Canadian Manufacturers' Association Annual Convention, held last week in Halifax, Nova Scotia Province. Opportunity has been taken at the same time to bring to the notice of our readers, a number of features relative to the growth and development of Canada's Maritime Provinces generally, and, while in the space at our disposal, much necessarily important and at the same time equally interesting material in the up-to-date record of industrial achievement which these eastern sections of our Dominion have accomplished and are doggedly persevering to surpass, has had to be unwillingly omitted, sufficient, we feel appears to whet the desire to learn more of the Maritime Provinces' possibilities, and to, may be, help foster and encourage a more popular movement in their favor.

The Convention proceedings, as has been already stated, are fully chronicled, and one cannot help feeling enthused with the optimism expressed and which generally prevailed, regarding the future of this Dominion. We may not all see eye to eye in the determination of the legislation which shall best fit the exigencies arising from the upbuilding and populating of a nationality such as Canada is striving towards to-day, yet we can at least exercise that tolerance, and render that assistance towards those who, we feel, are striving to attain that end by honesty of purpose and consideration for the welfare of each and all.

GOVERNMENT RETARDS TECHNICAL EDUCATION.

AT a time when the Dominion Government is professedly legislating for the encouragement of technical education in Canada, when a Royal Commission has just made its report, urging that something be done quickly to save this country from lagging behind, it is ironical that the Department of Customs should be doing something which has the effect of hampering the work of those cities which, by their own enterprise, have built technical schools that will easily compare with those in Great Britain, the United States and Germany. It is because of the desire of these cities to have their technical schools equipped with twentieth century machinery that they must suffer. Had they been content to train budding mechanics in the manipulation of antiquated machines, everything would have been serene, and technical education in Canada would have been retarded just that much. Let us state the facts:

The Finance Committee of the Toronto Board of Education called tenders for the supply of modern machine tools and woodworking machinery. Specifications were submitted by several prominent Toronto brokers, and the contracts awarded to those whose tenders were found most satisfactory. It so happened that several machines ordered were of foreign manufacture, and tenders were submitted on the assumption that such machinery would be allowed to enter the country free, under the heading of "philosophical apparatus." A hitch has arisen through the fact that the Department of Customs has ceased to allow machinery for educational purposes to enter the country free. The lathes, etc., are required in the school to allow work to proceed. They lie in bond, with $700 duty owing. The brokers who received the order will not pay the duty or they will be selling at a loss, so they have asked the Board of Education to assist them. Accordingly, Dr. McKay, Principal of the Toronto Technical School, has written to the Minister of Customs for an explanation.

The point is that, for many years, machinery for educational purposes has been non-dutiable. A college requiring a microscope for scientific purposes, gets it imported cheaply. How much more important then is it that the technical schools of Canada should be allowed to get their lathes, drill presses, etc., as cheaply as possible! The good work of technical education, on which the Government has liberally spent thousands of dollars simply to gain information, is being held up by a levy of $700 placed on it by the Government itself. There must surely be a misunderstanding.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

	Mont'l.	Tor'to.
Grey Forge, Pittsburg.	.....	14 25
Lake Superior, charcoal, Chicago	.....	14 50
Middlesboro, No. 3	20 00	21 50
Carron, special	22 50	.....
Carron, soft	22 50	.....
Cleveland, No. 3	20 00	22 00
Clarence, No. 3	20 00	21 00
Jarrow	.....	23 50
Glengarnock	.....	26 00
Michigan charcoal iron	27 00	.....
Ferro Nickel pig iron (Soo)	.....	25 00

BILLETS.

	Per Gross Ton.
Bessemer billets, Pittsburgh	$27 00
Open hearth billets, Pittsburgh.	27 00
Forging billets, Pittsburgh	34 00
Wire rods, Pittsburgh	28 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto	2.10
Steel bars, f.o.b., Toronto	2.15
Common bar iron, f.o.b., Montreal.	2.15
Steel bars, f.o.b., Montreal	2.25
Bessemer rails, heavy, at mill	1.25
Steel bars, Pittsburgh, future	1.40
Tank plates, Pittsburgh, future	1.45
Beams, Pittsburgh, future	1.45
Angles, Pittsburgh, future	1.45
Steel hoops, Pittsburgh	1.50

F.O.B., Toronto Warehouse.	Cents.
Steel bars	2.30
Small shapes	2.40

Warehouse, Freight and Duty to Pay.

	Cents.
Steel bars	1.85
Structural shapes	1.95
Plates	1.95

Freight, Pittsburgh to Toronto.

18 cents carload; 21 cents less carload.

IRON PIPE FITTINGS.

Canadian malleable, 40 per cent.; cast iron, 65; standard bushings, 70; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 75; malleable, lipped unions, 65.

BOILER PLATES.

			Mont'l.	Tor'to.
Plates, ¼ to ½ in., 100 lbs.			$2.35	$2.30
Heads, per 100 lbs.			2.65	2.65
Tank plates, 3-16 in.			2.60	2.55
Tubes, per 100 ft.,		1 inch	9.50	8.50
"	"	1¼ in.	9.50	8.50
"	"	1½ "	9.50	9.00
"	"	1¾ "	9.50	9.00
"	"	2 "	8.75	8.75
"	"	2½ "	11.15	11.50
"	"	3 "	12.10	12.00
"	"	3½ "	14.15	14.50
"	"	4 "	18.00	18.00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Stove bolts	80 & 7½
Machine bolts, ⅜ and less	65 & 5
Machine bolts, 7-16	57½
Blank bolts	57½
Bolt ends	57½
Machine screws, iron, brass	35 p c.
Nuts, sqnare, all sizes	4c per lb off
Nuts, Hexagon, all sizes	4¼ per lb off
Fillister head	25 per cent.
Iron rivets	60, 10 p c off
Wood screws, flathead, bright	85, 10, 7½ p c off
Wood screws, flathead, brass	75, 10, 7½ p c off
Wood screws, flathead bronze	70, 10, 7½ p c off

National-Acme "Milled Products."

Sq. & Hex Head Cap Screws	65 & 10%
Sq. & Hex Head Cay Screws	65 & 10%
Rd. & Fil. Hesd Cap Screws	45-10-10%
Flat & But. Head Cap Screws	40-10-10%
Finished Nuts up to 1 in.	75%
Finished Nuts over 1 in.	72%
Semi-Fin. Nuts, up to 1 in.	75%
Semi-Fin. Nuts over 1 in.	72%
Studs	65%

Discounts f.o.b., Montreal.

FINE STEEL WIRE.

Discount 25 per cent. List of extras. In 100-lb. lots: No. 17, $5; No. 18, $5.50; No. 19, $6; No. 20, $6.65; No. 21. $7; No. 22, $7.30; No. 23, $7.65; No. 24, $8; No. 25, $9; No. 26, $9.50; No. 27, $10; No. 28, $11; No. 29, $12; No. 30, $13; No. 31, $14; No. 32, $15; No. 33. $16; No. 34, $17. Extras net. Tinned wire, Nos. 17-25, $2; Nos. 26-31, $4; Nos. 30-34, $6. Coppered, 75c; oiling, 10c.

WROUGHT IRON PIPE.

The following are Toronto jobbers' discounts on pipe in effect from April 21, 1913:

	Buttweld		Lapweld	
Standard	Black	Gal.	Black	Gal.
¼ ⅜ in.	62	47	....	....
½ in.	68	58	....	....
¾ to 1½	71½	61½	68½	58½
2 in.	71½	61½	68½	58½
2½ to 4 in.	71½	61½	70½	60½
4½ to 6 in.	....	....	71½	61½
7, 8, 10 in.	....	....	66	54
X Strong P. E.				
¼, ⅜, ½in.	56½	46½	....	....
¾ to 1½ in.	67½	57½	....	....
2 to 3 in.	68½	58½	....	....
2½ to 4 in.	....	....	65	55
4½ to 6 in.	....	....	64	56
7 to 8 in.	....	....	55	45
XX Strong P. E.				
½ to 2 in.	43	33	....	....
2½ to 4 in.	....	....	43	33

PRICES OF WROUGHT IRON PIPE.

Standard.		Extra Strong.		D. Ex. Strong.	
Nom. Diam.	Price. per ft.	Sizes Ins.	Price per ft.	Size Ins.	Price per ft.
⅛in	$ .05½	⅛in	$ .12	½	$ .32
¼in	.06	¼in	.07½	¾	.35
⅜in	.06	⅜in	.07½	1	.37
½in	.08½	½in	.11	1¼	.52½
¾in	.11½	¾in	.15	1½	.65
1 in	.17½	1 in	.22	2	.91
1¼in	.23½	1¼in	.30	2½	1.37
1½in	.27½	1½in	.36½	3	1.86
2 in	.37	2 in	.50½	3½	2.30
2½in	.58½	2½in	.77	4	2.76
3 in	.76½	3 in	1.03	4½	3.26
3½in	.92	3½in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4½in	1.27	4½in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.86	...	.....
7 in	2.38	7 in	3.81	...	.....
8 in	2.50	8 in	4.34	...	.....
8 in	2.88	9 in	4.90	...	.....
9 in	3.45	10 in	5.48	...	.....
10 in	3.20	....	....	...	.....
10 in	3.50	....	....	...	.....
10 in	4.12	....	....	...	.....

NAILS AND SPIKES.

Standard steel wire nails, base		$2 40
Cut nails	$2 60	2 65
Miscellaneous wire nails	75 per cent.	
Pressed-spikes, ⅝ diam., 100 lbs.		2 85

OLD MATERIAL.

Dealers' Buying Prices.	Mont'l.	Tor'to.
Copper, light	$10 50	$11 50
Copper, crucible	12 50	14 50
Copper, uncr'bled, heavy	12 00	12 50
Copper wire, uncrc'bled	12 00	12 50
No. 1 machine compos'n.	11 00	12 50
No. 1 comps'n turnings..	9 50	9 50
No. 1 wrought iron	10 00	9 00
Heavy melting steel	9.50	10.00
No. 1 machinery cast iron	13 00	14 00
New brass clippings	8 50	9 00
No. 1 brass turnings	7 25	8 00
Heavy lead	3 50	4.25
Tea lead	2 75	3.20
Scrap zinc	3 00	3 50

COKE AND COAL.

Solvay Foundry Coke	5.95
Connellsville Foundry Coke	5.45
Yough, Steam Lump Coal	3.93
Penn. Steam Lump Coal	**3.63**
Best Slack	**2.95**

All net ton f.o.b. Toronto.

METALS.

	Mont'l.	Tor'to.
Lake copper	$17.25	$16.25
Electrolytic copper	17.25	16.25
Casting copper	17.25	16.00
Spelter	5.50	5.75
Lead	5.50	5.00
Tin	44.00	43.00
Antimony	8.50	9.00
Aluminum	22.00	18.00

MISCELLANEOUS.

	Cents
Putty, 100 lb drums	**$2.70**
Red dry lead, 5 cwt. casks, per cwt.	6.00
Glue, French medal, per lb	**0.10**
Tarred slaters' paper, per roll...	**0.95**
Motor gasoline, single bbls., gal..	0.26
Benzine, per gal.	**23½**
Pure turpentine	0.60
Linseed oil, raw	0.60
Linseed oil, boiled	0.63
Plaster of Paris, per bbl.	**2.10**
Plumbers' Oakum, per 100 lbs....	**3.25**
Pure Manila rope	**17**

SMOOTH STEEL WIRE.

No. 6-9 gauge, $2.25 base; No. 10 gauge, 6c extra; **No. 11 gauge, 12 extra; No. 12 gauge, 20c extra; No. 13 gauge, 30c extra; No. 14 gauge, 40c extra; No. 15 gauge, 55c extra; No. 16 gauge, 70c extra. Add 60c for coppering and $2 for tinning.**

Extra net per 100 lb.—Spring wire; bright soft drawn, 15c; charcoal (extra quality), $1.25.

SHEETS.

	Mont'l.	Tor'to.
Sheets, black, No. 28	$2.85	2.90
Canada plates, ordinary, 52 sheets	2 90	3 00
Canada plates, all bright.	**4 00**	**4 15**
Apollo brand, 10¾ oz. (American)	**4 30**	**4 20**
Queen's Head, 28 B.W.G.	4 40	4 40
Fleur-de-Lis, 28 B.W.G..	4 20	4 25
Gorbal's Best Best, No. 28	4 40	4 40
Viking metal, No. 28....	4 40	4 40

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents.

Montreal, September 22, 1913.—Though a general feeling of optimism pervades the air, it would be too much to say that business in the machinery trade is brisk at present. During the past week no special improvement has taken place in the situation. Orders for the equipment of the new Edmonton Technical School have been placed, but on a much reduced scale compared with the original enquiries. The tightness of money in the West, now happily passing away, is given as the reason for the reduction. Probably the present purchases will be supplemented by further equipment when financial conditions are more satisfactory. The local machinery houses are busily engaged on several enquiries recently received, and it is probable that there may be more interesting matter to report next week.

Business with the various local bridge-building and structural steel concerns is very brisk just now. The Dominion Bridge Co. is having difficulty in keeping up with its orders, and the Phoenix Bridge & Iron Works is said to have enough work on hand to keep it busy for the next six months. The latter firm is working overtime three nights a week in an endeavor to overtake orders.

Pig Iron, Copper, Etc.

There is little to report this week in regard to these markets. While several nice enquiries have been received for fair-sized lots of English pig iron, few actual orders have been booked and, these have ranged on the small side. This condition of affairs, however, is probably only temporary, and the immediate future is likely to see a resumption of brisk buying in anticipation of the end of navigation for the year.

Copper of all grades shows a fractional advance over last week's prices, but this market is very dull at present, only a few small lots having changed hands. Tin is a shade easier and lead remains unchanged. The supply of the latter for prompt delivery is very small.

The Montreal Trust Co. and Mr. Edgar McDougall have now been appointed joint liquidators of the Canada Iron Corporation. The former will look after the technical end of the liquidation, while Mr. McDougall will supervise the carrying on of the business during the liquidation. A meeting of the bondholders to discuss the plans now being worked out for the re-organization of the company is expected to be held within the next few weeks.

Toronto, Ont., Sept. 23, 1913.—Warehouse prices of steel are unchanged. There is marked activity in mill buying, due to the reluctance of manufacturers to buy other than absolute needs to carry them over the prevailing stiff market. The resultant activity on the part of the sellers has resulted in healthy competition, sometimes to the benefit of consumers. As stated last week, the prices of steel may be expected to be affected thereby. The situation is peculiar. One mill has all its orders for structural steel filled, and due to shortsightedness, is now without orders for this commodity. Thus, it has structural steel on its hands, whereas the same mill cannot deliver plates for months. On the other hand, its strongest competitor is in excellent shape, where the other is weak, and vice versa. This condition obtains in five or six different plants, both here and in the United States. A careful buyer might, therefore, replenish his stocks just now to excellent advantage.

The opinion is expressed on every hand that business will not revive again until the spring. Men who are as a rule reticent on this subject frankly give this as their opinion. The quietness in the building trade partly contributes to this condition. The farmers in the West will not be buying machinery until the spring, so that implement manufacturers will find business dull this winter. Steel makers expect a big volume of business in January. The pig iron market is firm, and prices have advanced both here and in the States. The Steel Co. of Canada is selling foundry pig at from $18.75 to $19, an advance of about a dollar.

Machine Tools.

Machine tool dealers declare that their business is better. A considerable portion of the order for machine tools to equip the new plant of the Union Carbide Co., at Welland, went to John Bertram & Sons, Dundas, Ont.

Metals.

The Canadian trade for metals is bad; the English trade is fair. Dealers report no changes in price. The market is steady, and business here is being done only in staple lines.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Engineering

Fort William.—The Superior Rolling Mills Co., Ltd., has deposited at Ottawa plans and description of its proposed wharf at Fort William, Ont.

Sarnia, Ont.—The Cleveland Foundry Co.'s new plant here will consist of three buildings measuring 200 x 100 feet. 250 men will be employed within a year.

Medicine Hat, Alta.—On Sept. 9 the ratepayers passed by-laws granting concessions to the Medicine Hat Brick Co., and the Western Canada Threshing Machine Co.

St. Boniface, Man. — It is reported that the William Galloway Co., will establish an agricultural implement factory in the near future at St. Boniface, Man., across the river from Winnipeg.

Toronto, Ont.—The Bawden Machine Co. have applied to the Board of Control for a permit to erect a cupola and foundry at 107 Sterling Road, where their new plant is located. The permit will probably be granted.

Hamilton, Ont.—The Sawyer-Massey Co. have taken out building permits for a new foundry building to be erected on Wellington Street North at a cost of $5,000, and the Grazelli Chemical Company for three new buildings on Ottawa Street to cost $5,000.

Lethbridge, Alta. — The Lethbridge Brewing and Malting Co. and the Ellison Milling Co. are doubling the capacity of their plants. The Lethbridge Iron Works, Niven Bros.' Brass Foundry and the Southern Alberta Welding Co. are adding new equipment.

Windsor, Ont.—The Swedish Crucible Steel Co., Hamtramck, Mich., a suburb of Detroit, manufacturers of the Olson tool steel plow point, will require for installation in its new plant now under construction at Windsor, Ont., a crane (either three or five-ton), direct-connected emery wheels, facing mills, tumbling mills, core and annealing ovens and a sand blast apparatus.

Chatham, Ont.—The Chatham Manufacturing Company has been organized and the following officers elected: President, W. H. Westman, Chatham; vice-president, H. W. Brown, Lansing, Mich.; secretary-treasurer and general manager, A. D. Westman. The company has taken over the entire business of the Chatham Malleable and Steel Manufacturing Co., and will build a large addition to the local plant in the near future.

Hamilton, Ont.—The Canadian Westinghouse Co., has decided to erect a new foundry building on Aberdeen avenue in the vicinity of the golf links at a cost of about $150,000. The contract has already been awarded to H. G. Christman and Son. The company, it was said, had secured sufficient land for further extensions when necessary. The new building will be of reinforced concrete construction, and work will be started immediately.

N. T. R. QUEBEC SHOPS.

Mayor Drouin, Quebec, received a telegram from Major Leonard of the Transcontinental Railway Commission that the contract for the construction of the workshops of the N. T. R. at St. Malo had been awarded to Contractor Gosselin, of Levis, and that the contract had been signed on the morning of September 16. The cost of the work, which is to be started immediately, will be $1,500,000.

Electrical

South Vancouver, B.C.—This town will probably spend $600,000 on a municipal electric plant.

Stratford, Ont.—The city has discontinued the use of electricity for the water pumps owing to increased Hydro-Electric charges.

Kingston, Ont.—It is likely that the City Council will again ask Hon. Adam Beck what he can give Kingston in the way of hydro power, now that it is proposed to generate current at the High Falls on the Madawaska River.

Fort William, Ont.—There are strong indications that the Hydro Electric Commission of Ontario, is prepared to go through with a scheme to put in a plant for the manufacture of hydro-electric power at Dog Lake. The indications are further substantiated by the arrival in this city of hydro-electric inspector Hogg, of Toronto, with four assistant engineers, who left for Dog Lake.

South Vancouver.—A resolution in favor of the establishment of a municipal electric plant has been passed by the Council. It is the direct result of a report by the municipal electrician to the effect that for an initial cost of $600,000 an electric power and light plant could be established capable of serving the district for the next five years. It is estimated that electricity for lighting purposes could be supplied at seven cents per kilowatt hour, and for power purposes at two cents per kilowatt on the day load, and the plant still be revenue-producing. Crude oil for the generating plant is advised. The question of the desirability of a municipal gas plant is also under consideration.

General Industrial

New Westminster, B.C.—The Vancouver Milling and Grain Co., Ltd., will build elevators on Front Street.

Thorold, Ont.—The new plant of the Ontario Pulp Co., erected at a cost of about $1,000,000, was placed in operation September 11.

St. John, N.B.—Mechanical coal punches have been installed in the Tothwell Coal Co. mines at Minto, and others will be purchased later.

Smith's Falls, Ont.—The Lewis Medicine Co., on Water street, of which Mr. H. E. Smith, is manager, is installing machinery in its premises to manufacture its medicines here in future.

Toronto, Ont.—The Canadian Mineral Rubber Co. was wound up on an order granted at Osgoode Hall, Sept. 19. The company was incorporated in 1909 with a capital stock of $1,500,000.

Vancouver, B.C. — Negotiations are proceeding for the establishment of a factory by the Kelly Springfield Tire Co. on the north arm of the Fraser River, near Main Street, which, it is anticipated, will have a payroll of $20,000 a month.

Medicine Hat, Alta.—From a letter read at the meeting of the City Council September 15, it would appear that it will not be long before work is started on the erection of the Maple Leaf Mills

here. The letter was from H. G. Shaw, general manager of the Company.

New Westminister, B.C.—Exhaustive data concerning the entire property of the Westminster Gas Co., are being compiled for submission to Mr. H. N. Pabst, Portland, Ore., consulting gas engineer, who was chosen as the city's adviser in connection with the proposed municipal gas plant.

Creston, B.C. — A canning establishment for the Creston district is now assured. David Timmins and associates have already commenced operations on a plant, and a Winnipeg wholesale house has already begun negotiations for the entire output of the factory.

Moose Jaw, Sask.—A fire at Milestone totally destroyed the International elevator and a private elevator owned by O. K. Wilson, Milestone. The loss to the International Elevator Co., is 20,000 bushels of grain, fully insured, while Wilson lost 25,000 bushels of grain with $15,000 insurance.

Medicine Hat, Alta. — An agreement has been signed between the City Council of Medicine Hat, Alberta, and the Dominion Sanitary Fountain Co., capitalized at $100,000, by which the latter agrees to erect a plant valued at $15,000. The company has a factory in Spokane and other cities in the United States.

Shawinigan Falls, Que. — The Belgo-Canadian Pulp & Paper Co., Shawinigan Falls, Que., will erect a sulphite mill of a capacity of 50 tons per day per 24 hour, with necessary buildings so as to permit of an extension of output to 100 tons. The company is also planning an extension to the paper mill, which will be completed about the end of next year.

Calgary, Alta.—A syndicate of local and Minneapolis capitalists, of which G. G. Devonish is the head, will shortly commence the erection of a large flour mill at Calgary, Alberta. The mill will be built in four units to cost $1,400,000 each, and, when all are completed, will have a capacity of 6,000 barrels of flour per day. Work on the first unit will be commenced immediately.

Contracts Awarded

Victoria, B.C. — Albert Kelley, of Seattle, has been awarded a contract by the Pelton Water Wheel Co., for two miles of welded steel pressure pipe from 48 to 54 inches in diameter, for the hydro-electric plant at the Jordan river.

Victoria, B.C.— Excavation work on the site of the new Hudson's Bay department store in the city of Victoria, has been commenced by Messrs. Luney Brothers, who have been awarded the contract for this work.

Medicine Hat, Alta.—The city will build a large addition to its power plant and instal generators to furnish 2,500 k.w. at a cost of $250,000. A new plant now being erected has a capacity of 1,500 k.w., which is all spoken for.

Port Arthur, Ont.—The Western Drydock and Shipbuilding Co., have been awarded the contract to repair the two C.P.R. steamers Alberta and Athabasca. Both steamers are to be completely fitted out with new boilers and accessories, and undergo other general repairs. It is stated that the cost of the work of improvements when completed, will amount to considerably over $65,000.

Marine

Vancouver, B.C.—H. H. Stevens, M. P., has confirmed the statement that the Federal Government is negotiating with an engineering company for the construction of drydocks at Vancouver larger than any drydock now in service on the North Pacific coast.

Toronto, Ont.—The plant will be built, and everything ready for the improvements to the Toronto harbor at the opening of the season next spring, according to W. T. Stewart, president of the Canadian Stewart Company. Contracts amounting to $11,000,000 have been awarded his company for the work. Four high power sand dredges, several bucket dredges, about six pile drivers, a fleet of scows, tugs, and big barges will compose the plant. The whole of it will be built in Canada, and as much as possible in Toronto.

New Incorporations

Bosch Magneto Co., Ltd., incorporated at Ottawa, capital $25,000, to manufacture machinery, etc., at Toronto. Incorporators: Frederick D. Norman, Walter J. Boland, etc., Toronto.

L'Original Stave and Lumber Mfg. Co., Ltd., incorporated at Ottawa, capital $145,000, to manufacture staves, etc., at L'Original, Ont. Incorporators: Thibaudeau Rinfret, Joseph E. Billette, Livens, etc., Detroit.

Kas-so Kitch-e-mon-e-too So-ne-ah, Ltd., incorporated at Ottawa, capital $50,000, to manufacture building materials, etc., at Montreal. Incorporators: John E. Bulmer, William G. Taylor, etc., Montreal.

The Union Electro-Products Co., Ltd., incorporated at Ottawa, capital $40,000, to manufacture and sell electric cooking and heating utensils, at Windsor, Ont. Incorporators: Mac Livens, Harry N. A.

Canadian Krantz Electrical and Manufacturing Co., Ltd., incorporated at Toronto, capital $160,000, to manufacture electric supplies, fittings, etc., at Toronto. Incorporators: William N. Ferguson, Harcourt Ferguson, etc., of Toronto.

Building Notes

Toronto, Ont.—Toronto is to have another sky-scraper, which will be built by a large Montreal financial institution, on West King street. The property takes in 105 feet, immediately east of the Woodbine Hotel, from numbers 90 to 98.

Toronto, Ont.—Construction work on the new seven-storey C.P.R. office building on the southeast corner of King and Simcoe streets, has been started. The permit for the erection of the structure, at a cost of $250,000, was issued yesterday and the P. W. Lyall Co., contractors, have started excavation work. The new building will be used for freight offices only.

Railways—Bridges

Hamilton.—A bridge to cost $100,000 is being planned by the McKittrick syndicate to be built to connect the southwestern portion of the city with the real estate owned by the syndicate.

London, Ont.—At the meeting of the City Council held last week, it was decided to submit a by-law to the ratepayers to expend $700,000 on the electrification of the London and Port Stanley Railway.

Humboldt, Sask.—An order becomes effective on October 15 for the removal to Humboldt from North Battleford of the C.N.R. shops. This means the removal of 200 railway men and the construction of ten more stalls at the round house.

Hanover, Ont.—The erection of the new iron bridge at John Hudson's, Bentwick Township, has been begun. Joseph Cope, of Chesley, is the contractor for the cement work, while the Corbett Company, of Owen Sound, are looking after the ironwork.

Wood-Working

Dryden, Ont.—The Rock Lake Lumber Co., had a big fire last week, destroying the planing mill.

The Design or Re-Design of a Factory Lighting System*

By M. H. Flexner and H. O. Dicker

Better light is as necessary as sanitary requirements and with these it should rank among the first. The aim of this paper is to bring out a few of the most important factors, relative to this all important feature, and to show how easily and cheaply existing unsatisfactory conditions may be bettered.

IT is somewhat discouraging to the illuminating engineer to read article after article dealing with the methods used to raise the sanitary condition of the factory, and when all have been read, he asks himself, "What about the lighting?" Ventilation, cleanliness, devices for safe operation of machines, rest rooms for employees, are all discussed, but little or no attention is given the lighting. It is the hope of the authors that this paper will emphasize the fact that factory lighting is a subject dealing directly with sanitation, and that it should be considered as such.

Importance of Good Lighting.

Why is the lighting important, and whom does it affect? Does it mean a benefit for the central station only, or is it of equal benefit and importance to employer and employee? It seems just as reasonable to ask why should a factory be ventilated, or why should it ever be cleaned up. The owner or manager would immediately say: "If I do not ventilate the work rooms, the operators will become dull and lose interest in their work." Regarding his lighting conditions he knows naught, and his answer to a question relative to his lighting condition would very likely show that he never gave it much thought. This is just the man who needs some information regarding lighting. He does not realize that just as many of the headaches are caused by poor lighting in factories as there are from poor ventilation.

This is not intended to belittle the importance of good ventilation, but is only mentioned to emphasize the fact that general improvement of condition does not end when a factory has been properly ventilated or properly cleaned. It does not end until the lighting as well as these have been considered. One is just as important as the other, since injury to the eye from poor lighting causes suffering equal to or even greater than the sickness caused from poor ventilation. In considering such vital subjects, we seem to be far in the rear of countries on the other side. We're behind the times, so to speak, and have not kept pace with France, England and other European countries, who are protecting their workmen, along these lines.

*From a paper read at the Seventh Annual Convention of the Illuminating Engineering Society, Pittsburg, Pa., September, 1913.

What is Good Illumination?

The first question that might be asked is: What is good illumination, or what is practical "lumination? Can we spot a unit or cluster here or there, put a drop light over the working places in a slip-shod sort of manner and expect to be satisfied with the results; or, is it a matter of knowing what to expect from each means of illumination and its corresponding reflector, and to fit in these units to meet the conditions in the factory? Our common sense dictates that it is the latter. Our experience teaches us that the problems involved are often difficult of solution, and that we must have definite ideas about correct illumination before we attempt to accomplish satisfactory results.

One authority defines good lighting as any system which does not attract attention to the means of illumination, or cause one to wonder how the illumination was obtained. An analysis of this yields the following requirements for good lighting:

First, that sources of high intensity must not be in the field of ordinary vision; second, that the amount of light be sufficient for the work to be done; third, that the distribution of light be uniform or as nearly so as possible; and fourth, that the color be pleasing to the eye. By adhering to these principles, we will not go far wrong in laying out lighting installations, whether for factory or for home, being assured of good illumination.

Value of Good Illumination.

The value of good illumination should not be under-estimated. Some are contented to travel along in the old-time worn ruts, and to leave well enough alone. Many believe that as long as there is light, whether good or bad, the question of lighting is settled, and that the results obtained are as good as any light could produce. This is the wrong idea, but nevertheless it is entertained by many managers and officials of factories under whose jurisdiction the question of lighting comes. They must, however, realize sooner or later the value of better operating conditions, produced by good lighting. To do work, light is necessary; with a light, a little work can be done, and, with more light, more work can be acomplished. This is very evident, and it is easily seen that no matter how a shop is lighted, if it can be better lighted, better or more work must result, up to a definite per cent. increase in efficiency of the workman.

What if our Mr. Official had to go home to a dimly lighted dining room? How would he like to read a paper which necessitated straining his eyes, or shave in little or no light, with his face very near the mirror and his eyes fixed in a staring position? It would not be very comfortable, and he could hardly give himself much of a shave; yet under these conditions he expects his men to work, to turn out good work, and make his factory an efficient one.

Initial Cost the Barrier.

There are such things as good and bad lighting installations, and to the progressive official the best should not be too good for his men. However, the initial cost is given first consideration, and is the one stone that lies in the path of all changes, and, therefore, we can but sum up the reasons why it is worth every cent that is asked in making a lighting installation a good and efficient one.

Statistics have shown that, as the result of better illumination and a decreased strain on the eye, the physical condition of the workmen is better, they are better satisfied, imperfections in the work have been materially decreased, and the factory output increased from 8 to 15 per cent.

Accident Risk Feature.

Not only is the general physical condition of the workman improved by better lighting, but his liability to accident is greatly decreased. Recently published statistics show that during those months of the year in which artificial lighting must be used, there occurs a greater number of accidents than in the light months. The saving made by good lighting in this line alone will often more than repay the extra cost of installing and maintaining the lighting system. It has been said that a man who is obliged to keep one eye on the danger points of a machine has only one eye left to operate it. This is unquestionably true, and consequently a machine must be made absolutely safe. The factory manager usually tries to accomplish this by putting a guard rail around the danger points or else enclosing them entirely. This seems about as reasonable as putting a rail around a hole in a street without placing a lantern on it.

Protected machines still cause accidents, and will continue to do so until the proper light is provided and the danger points brought well into view. Accidents are becoming more expensive each year, and, disregarding all humanitarian arguments, an owner can no longer neglect to protect the operators from accidents. Good light is the most effective protection that can be provided, and only carelessness on the part of the employee will incur accident under these conditions.

"It costs us a lot of money, but it has paid for itself in less than a year," said one manufacturer. What more can an owner want? Certain courts have held that failure to illuminate danger points constitutes "contributory negligence." Germany, Austria, Holland and France, realizing the importance of good lighting conditions, have included lighting in their codes for factory inspection of health and safety.

In the installation one must take into account the position of the machines, the work that is done, the location of posts, the windows, and, in fact, every condition which may in some way cause deep shadows and bad illumination. The scope of this paper does not allow us to enter into any detailed account of layouts. As stated in the introduction, we are only attempting to emphasize the necessity and advantage of better factory lighting.

Good Lighting Available.

Good factory lighting is not beyond reach; it is not something that one can only wish for. It is a material thing and may be had for the asking. A great many bad installations can be made good ones by two inexpensive methods; either re-locating the units and the addition of proper reflectors, or in some cases by replacing existing units with some of the modern efficient type now on the market. It is not hard to show that the new system will, within a given time, pay for itself, and in a great many cases save money over the operating and maintenance expenses of the old system.

Assume that the owner of a factory depends solely upon the profits of the work his employees turn out. An equation expressing output must involve the personal equation of the men, and there must be a certain personal efficiency of each man under every condition in which he works. If a high-priced man is placed under poor working conditions, his work will be no better than the low-priced man under good conditions. A manufacturer will usually buy a labor-saving device or a machine with which his workers can turn out more or better work, and he will supply his employees with tools of the highest grade steel, and have men to keep these tools in the very best condition; but he often absolutely ignores the personal efficiency of the operator and the conditions under which he must work. He does not usually see all the methods of making the man as perfect as his tools. In other words, more time and thought is given to the tools than the operator.

What good is a perfect tool or machine if the operator can hardly see what he is doing with it? This sounds ridiculous, of course, but it is true of many factories to-day. For instance, a manufacturer purchased a certain machine at a cost of $18,000.00, and paid a high priced man of long experience to operate it. Yet this owner could not see his way clear to spend $19.00 in order that this high priced operator would not have to take the product twenty feet away to the window to caliper it. This shows how little the owner considered the personal efficiency of his men.

Illumination Cost.

The cost of illumination as compared with an operator's salary is very small and insignificant; in fact, so small that the manufacturer can not see it at all. The following data, taken as average conditions, show this.

If a 100-watt lamp is assumed for each man, and that it burns 3½ hours per day for 300 days, the following is derived:

Cost of lamp (Commonwealth Edison Co. renewal)		$0.00
Cost of reflector		1.00
Cost or wiring per outlet		4.00
Total first cost		$5.00
Interest on investment 6%	$0.30	
Depreciation at 12½%	0.70	$1.00
Power at 5c		5.00
Cleaning at 3c. per mo		0.36
Renewal of lamps		0.00
Total		$6.36

Wages for 10 hours a day, 300 days, may be assumed to be $1,000.00. Thus the ratio of the cost of furnishing illumination to a man under the above conditions would be (overhead expense not included), $\frac{6.36}{1,000}$, or 0.636 per cent.

The following mathematical deduction shows what good lighting would mean to a factory upon the installation of such a system. Taking an area of 30,000 square feet with an average of 0.75 watt per square foot, a connected load of 22,500 watts would result. Figuring the installation with 250 watt units, an estimate of the first cost is surprisingly low:

90 250-watt outlets at $3.50	$315.00
90 fixtures at $1.25	112.50
90 reflectors at $1.00	90.00
90 lamps (Commonwealth Edison Co. renewal)	0.00
Total	$517.50

Let it be supposed that this factory turns out a yearly business of $250,000, and that 33 1-3 per cent., or $83,333.33 of this business is done under artificial light. Assuming a conservatively 5 per cent. increase in output as the benefit due to good lighting, the business is then increased $4,166.67. If there is a profit of 20 per cent. on this output, a credit of $833.33 is derived, which is considerably more than the installation cost.

Data From Trial Installations.

As further proof of the low installing and operating costs of good lighting the following data are submitted from a table compiled from actual figures on three trial installations in a large factory with lamp prices, etc., revised so as to be up-to-date.

100-Watt Tungsten Lamp.

30 reflectors at 92 c.	$27.60
Wiring at $3.22 per outlet	96.60
30 lamps at 0.72	21.60
Total	$145.80
Interest on investment at 6%	$8.75
Depreciation on reflectors at 12½%	3.45
Depreciation on wiring, etc., at 5%	4.83
Renewals at 30 × 900-1,000 hrs. × 0.621	16.77
Energy 3,000 × 900 hrs. × 1.1 c.	29.70
Labor (cleaning 30 × 0.63 × 20 c.)	3.78
Total annual cost	$67.28

These figures are derived on the assumption that good factory lighting will necessitate a 100-watt lamp for 100 square feet of working area required by an ordinary workman. With these assumptions, the following information has been tabulated:

Total working hours 300 × 10	3,000 hours
Total lighting hours 300 × 3 1-3	1,000 hours
Average cost of labor per hour	35 cents
Labor—	
3,000 hours at 35 c.	$1,050.00
Light—	
Cost of 100-watt tungsten lamp (Commonwealth Edison Co. renewal)	$0.00
Cost of metal reflector (trade price)	1.00
Average cost of wiring per outlet.	3.50
Initial investment per outlet	$4.50

Interest at 6% on $4.50....	0.27	
Depreciation at 12½% on $.50	0.56	0.83
Cleaning 12 mo. at 3 c......	0.36	
Lamp Renewals (Maintenance	0.00	0.36
Energy 100 K.W.H.at 5 c.......		5.00
Annual operation cost		6.19
Annual wages for one man....		$1,050.00
Cost of light in per cent. of wages		.59

When reduced to cost per hour based on 3,000 working hours per year, one finds:

Labor per hour	$0.35
Light per hour	0.00619
Cost of light per day........	0.02063
Cost of labor per day	3.50

These figures go to show that the cost of good lighting is a very small portion of the cost for a man's time; in fact, if good lighting would save five minutes of a man's time per day a material gain would be experienced. By following this form, any local conditions causing different prices than those given can be substituted so that a comparative figure can be obtained for any particular locality.

Tungsten Lamps Maintenance Costs.

The cost of maintenance of tungsten lamps and reflectors is stated as follows in the 1911 Proceedings of the National Electric Light Association.

	Per Cent.
Renewals of lamps	75
Renewals of broken reflectors....	3
Labor making renewals......	0
Changing reflectors for washing	16
Labor for washing reflectors	2
Additional indirect charges...	4
	100

This data is from experience with an installation of between 7,000 and 8,000 lamps and reflectors.

Individual Conditions Feature.

With the available units, it is impossible to pick out one lighting unit, and say that it can be used for all conditions. There is no one cure for all evils. Individual conditions enter into the problem, and the resulting unit must be best for the conditions presented. The most important qualifications are the following: Efficiency; color; quality; arrangement of machines — processes; adaptability; special architectural features; and available hanging height.

The best unit to use will be the one that best fulfils these requirements. Each light source, whether gas arc, individual gas, electric incandescent, arc or vapor lamps, has its definite field in factory lighting. Usually where one should be used, the others will be less satisfactory. It is hard to convince the owner that the cheapest is not the best, for he usually wants light only, and often will not pay for the necessary equipment to produce illumination. The problem of which one to use depends upon the class of work to be done under it, as each lamp has certain characteristics that argue for and against its use.

Arc Lamps.

The last few years have brought great developments in the arc lamp. The flame arc of long life furnishes a light source of high candle-power and low maintenance cost. When the white light-giving carbons are used, the light emitted is of good but rather variable color. This lamp should never be used in the normal range of vision. It is best adapted to factories with high ceilings, as the intrinsic brilliancy of this light source is 5,000 candle-power per square inch. There has been considerable talk about the harmful ultra-violet rays emitted from arc lamps. These rays are no doubt given off to a considerable extent, but they are lost in the inner globe. Therefore, this characteristic should not be an argument against the arc lamp. The greatest objection to this light source is its unsteadiness, and for fine accurate work a more steady unit might better be used.

Mercury Vapor Lamps.

Mercury-vapor lamps are particularly well adapted to certain kinds of manufacturing. The peculiar color, together with the high visual acuity, renders them very useful. A large clothing manufacturing concern has recently replaced enclosed arcs with vapor lamps in pressing rooms. It is remarkable how scorching can be detected under this lamp, while if a tungsten lamp be used, the scorch is not so noticeable. The vapor lamp has met with decided approval in this kind of work, which goes to show that the unit adopted should depend entirely upon the work to be done.

Tungsten Lamps.

In installations where the tungsten lamp is the source of light, too much emphasis cannot be put on the subject of cleaning. The manufacturer would not allow his operators to leave their machines at night without cleaning them; the floors are cleaned and each morning the factory is found in tip-top shape. Why? So that the work may begin under the best conditions. The owner knows that time and money spent in cleaning a machine is well spent, and yet that which has a greater effect on the efficiency of the operator is left to accumulate dirt from day to day and in many factories from month to month.

Light Location..

In general, it is best to have the light source as high as possible above the working plane. If it is out of reach of the worker, he cannot handle it, and thus it will be free of a coating of oil or other dirt. Truly enough, certain machines require drop cords in setting up the work or changing the dies, but few machines actually need drop cords during their operation. One big railroad shop in Chicago has adopted Cooper-Hewitt lamps for general lighting, and drop cords are checked as any other tool. In this way they are taken care of, and are not used except when necessary. It has been our experience that the worker will use a drop cord as long as he has one in front of him. The first move for efficient lighting is general illumination, where possible, doing away with the drop cord, or as above stated, making the drop cord a working tool.

Concluding Observations.

In summing up, we believe that the campaign for good factory lighting has just begun, and that the best argument in favor of better illumination is a statement showing the benefits derived from an efficient lighting system and the experiences of others. Even a hasty reconsideration of the arguments presented in this paper demonstrates the tremendous scope and possibilities along this line. There is no longer any excuse for poor lighting, for the necessity, the practicability, and the economy of good illumination have been demonstrated beyond question, and if the strides in this direction which have been made in recent past may be taken as an index of those which will be made in the future, there is no doubt that very soon the time-worn phrase, "a badly lighted shop," will have disappeared from the vocabulary of those connected with the lighting industry.

We believe that if a fair and broad-minded manufacturer will but figure out in a common sense way the merits and necessity of good illumination, he will be converted to its use in a short time. If his own figures do not satisfy him, let him consult those who have been far-sighted enough to go ahead, and he will realize sooner or later the needs of his men—better atmosphere, lighter and cleaner shops, and proper illumination.

Manufacturers Will Wear Identity Button.—After organizing, the Vancouver Manufacturers' Association found that it was rather difficult to become acquainted with one another, and to facilitate friendship a numbered lapel button is now proposed. The wearer possesses a numbered badge and a card with numbers and names opposite. When he sees a man with a numbered button he notes the number and looks up the card. Opposite the number is the man's name, and the other man doing the same, they address one another by their right names.

New Grey Iron Foundry, Etc., Montreal Locomotive Works

Staff Article

Although the foundry here described is not yet quite completed, it is sufficiently far advanced to enable an adequate conception of its general features and lay-out to be formed. It shows evidences of carefully thought-out design, and will prove an important factor in increasing the output of this Canadian locomotive works.

DURING the past few years, the demands of the railroads for rolling stock of every kind have increased enormously, and locomotive and car builders have consequently been kept extremely busy. ·s a result, new plants have sprung up in various parts of the country, and old plants have been added to or in some cases almost entirely remodelled.

In common with other firms, the American Locomotive Company, who are probably the largest builders of locomotives in the world, have had to add to their several plants from time to time in order to keep abreast of their orders, and they are now completing extensive additions to their Canadian branch,—the Montreal Locomotive Works. These additions comprise a new machine shop, grey iron foundry, and a running shed. Of these, the foundry is the most important, the other two being in the nature of extensions to existing shops.

The new running shed forms an annex to the erecting shop, which is of the transverse type. It stands about halfway down the erecting shop, and is intended to relieve the latter of much of the lighter work. As soon as the heavy erecting is finished, and an engine wheeled, it will be taken out into the running shed where the lighter work will be completed under a 10-ton crane, thus giving increased space in the erecting shop and enabling the 120-ton crane to be more or less continuously employed on lifts better suited to its capacity.

The new shed is 122 feet long by 66 feet wide, and has three locomotive pits, pitched at 18 feet centres, running its full length. A 10-ton Northern crane of the 3-motor. type serves the whole floor area. The walls of this building are of 8-inch reinforced concrete for a height of 4 feet from floor level, above which they are of 2-inch reinforced cement plaster. The object of this form of construction is to facilitate the extension of the running shed sideways at some future time. The height of the roof is 40 feet above floor level, while the head room to the roof truss chords is 33 feet. Good natural lighting is secured by continuous swinging sash windows at each side. These extend about 16 feet down from the roof and are operated by levers from floor level. The entrances to the shed are fitted with rolling steel doors operated from inside or outside the building. Artificial lighting is by tungsten lights, and heating is by direct radiation The smoke jacks below which the locomotives are steamed are connected with an underground duct, through which the smoke is removed by an exhaust fan.

New Machine Shop.

The new machine shop is situated at the north end of the new foundry and adjoins the old machine shop. It is 222 feet long by 132 feet wide and is divided by central steel columns into two 66 ft. bays. Each bay is extremely well lighted by long skylights in the roof. These skylights are built with lead-covered steel bars, and are provided with copper

NEW FOUNDRY STORAGE BAY AND CHARGING FLOOR.
The open space below charging floor forms the blower room.

ventilators. The general construction is of steel and brick, with a concrete water table 5 feet high. The steel window frames are fitted with Fenestra sash, and the monitors with swinging sash in three sections, opening the full length of the building. There is a flat gypsum roof covered with tar paper and gravel. It is of fireproof construction, and is similar in every way to the roof of the foundry.

At present the north bay of this building is being used for heavy machine work,—principally cylinders, while the south bay is being temporarily utilized as an assembling shop for tender trucks and a paint shop for tanks and cabs.

The majority of the machine tools in the north bay are arranged for group driving, but the larger ones have individual motor drives, the heavy planers being fitted with the Niles reversing motor drive which is giving excellent satisfaction. This machine bay is served by a Niles 3-motor crane of 10 tons capacity, while the other bay has a 16-ton crane of similar type and make.

The shop is lighted by tungsten lamps and heated on the indirect expansion system, the hot air being conveyed in underground ducts to openings at floor level.

The Grey Iron Foundry.

The new foundry forms the largest, and perhaps the most important, part of the plant extensions. It adjoins the new machine shop and, like the latter, is a self-supporting steel structure of fireproof construction. It is 280 feet long by 222 feet wide, divided into four bays. The general style of construction is similar to that in the machine shop, the walls being of concrete and brick. The concrete extends 5 feet above floor level, and, from this height nearly up to the roof, there are large steel sash windows as may be seen in the illustrations. These, combined with the windows in the sides of the monitor over the main bay, give splendid natural lighting. In fact, this foundry will very probably prove to be one of the best lighted in the Dominion.

A special feature of the foundry is a large storage bay extending the full length of the building. This bay is 280 ft. long by 66 feet wide and affords space for the storage of a very large supply of pig, coke, sand, etc., and entirely eliminates the necessity of going out into the usual foundry yard for supplies of raw material. In severe winter weather, it is extremely hard to get men to do this class of work where no protection from the elements is afforded them. This storage bay has a standard gauge track running up one side, by which material is brought in. The track continues on into the machine shop, and, is, of course, connected with the yard trackage system at both ends. It is only

NEW FOUNDRY AND MACHINE SHOP, LOOKING EAST.

SOUTH END AND EAST SIDE OF NEW FOUNDRY, SHOWING ENTRANCE TO STORAGE BAY.

in a few of the most modern foundries that this idea of an enclosed storage bay is to be found, but it is a feature that will doubtless be more often adopted in future in northern latitudes, as, in those few foundries already so designed, the additional cost has been found to be fully justified.

Leaving the storage bay for the present, attention may be directed to the main part of the foundry. This consists of a main bay 66 feet wide and two side bays of 45 feet. The main bay has a height to roof of 46 feet and to the lower side of roof trusses of 37 feet. It is served by one 10-ton and one 20-ton Niles crane, and will, of course, be chiefly used for cylinder moulding and other heavy work; though part of this floor will probably be occupied by bench moulders also.

The Side Bays.

The side bays are 45 feet wide, with a height to roof of 31 feet, and to the under side of trusses of 24 feet. The west bay will be devoted to core-making and light moulding operations and is served by a 5-ton Northern crane. At one end of this bay is located a small store room, above which is the lavatory room. The latter is reached by an easy stairway and is fitted out with conveniences of the most modern type. In addition to those found in this room, porcelain urinals are built into the walls at convenient points around the foundry. Sanitary drinkiug fountains are also provided, and the general comfort of the men is well looked after. The foundry will be heated in winter by the indirect system, the hot air being carried in overhead galvanized sheet steel ducts. From these it will be brought down to a suitable height above floor level by bifurcated down pipes.

Cupolas, Cleaning Room, Etc.

The east 45 ft. bay is occupied by the core and sand mixing departments, the cupola room, a small carpenters' shop and the cleaning room. The cupola room contains two cupolas, a No. 8 and a No. 9 Whiting. Below the charging platform the cupola room is divided into two parts by a longitudinal brick wall, the rear portion forming the blower room. The blower will be electrically driven, but the type has not yet been definitely decided upon.

The charging platform is the same length as the cupola room,—60 feet, but is considerably wider, so that it projects out into the storage bay, as may be

SOUTHERN ELEVATION OF NEW FOUNDRY.

THE FOUNDRY, LOOKING SOUTH, SHOWING GENERAL STYLE OF CONSTRUCTION.

seen in the illustration of the latter. The object of this is to enable the 10-ton crane in the storage bay to deliver the skips containing the charges direct to the platform. The charges will be weighed en route on a multiple beam portable weighing machine suspended from the crane hook.

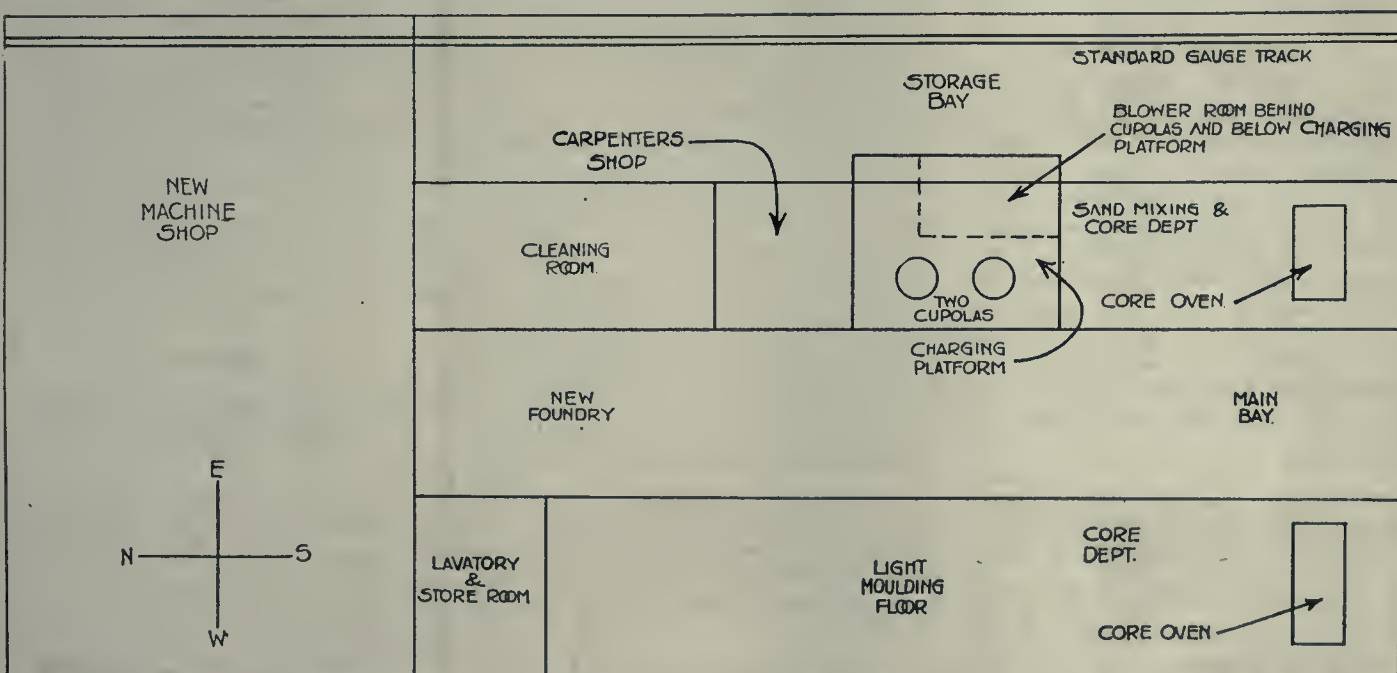
Instead of the charging having a number of narrow gauge storage tracks served by a transfer table, as is often done, it is equipped with a 5-ton overhead crane. This will pick up a skip from any part of the platform and transfer it to a narrow gauge track. It will then be run on to the pneumatic charging machine with which each cupola is fitted. Provision has been made for extending the charging platform in a southerly direction and installing a third cupola at some future date, if found necessary.

At the north end of the cupola room there is a small carpenter's shop entirely enclosed with brick walls as a precaution against fire. It is 20 feet long by the full width of the bay, and will be used for making and repairing wooden flasks. Next to the carpenter's shop is the cleaning room, 120 feet by 45 feet. A 10-ton Northern crane serves the whole length of the room. Sand blast apparatus and other up-to-date equipment will be installed, the cleaning room being of course piped for compressed air, like the rest of the foundry.

The building is entirely fire-proof, there being no wood work whatever in the interior; except a few small doors, and these are covered with sheet iron. The main doors are of the steel roller type.

This foundry has been built to the designs of Mr. William Dalton, chief engineer of the American Locomotive Co. The foundations and concrete work were built by the American Locomotive Co., while E. G. M. Cape, Montreal, was the contractor for the brick work. The structural Steel Co., Montreal, fabricated the steel work, and the contractors for the gypsum roofs were the Keystone Fireproof Roofiing Co., New York., and for the tar and gravel roofs, Jas. Akroyd & Sons, Albany, N.Y. The foundations were completed in time to allow the first steel work to be erected on June 1st of this year. The building is now more than 90 per cent. completed, which will generally be conceded to be a very good performance.

The Montreal Locomotive Works fully expect that these additions to their plant, which have cost in the neighborhood of $600,000, will enable them to increase their output by more than 30 per cent. For the year ending June 30, last, they turned out 300 heavy locomotives, and are aiming to increase this figure to 400 in the next twelve months. The new machine shop is already in operation, and is giving considerable relief to the older shop.



GROUND PLAN AND NEW FOUNDRY LAYOUT, MONTREAL LOCOMOTIVE CO.

LAKE SUPERIOR CORPORATION.

THE annual meeting of the Lake Superior Corporation was held at Camden, N.J., on October 1. In the absence of Mr. T. J. Drummond, President of the Corporation, Mr. Walter K. Whigham was elected chairman. In calling the meeting to order, Mr. Whigham said that he reported with regret that Mr. Drummond had been ill, and confined to his home for several months past, and that on that account he had now tendered his resignation as a director.

The chairman stated that during the year the corporation and the directors had lost through death the valuable services and counsel of Mr. Herbert M. Price of Quebec. He also stated that Mr. J. Tennall Lea of Philadelphia, who for many years had been vice-president of the corporation, had expressed a wish to be relieved of his duties, and that the board felt with great reluctance that his request must be accepted, as Mr. Lea was entitled to a well-earned rest from the active management.

The following were elected directors: —W. K. Whigham, London; Frederick McOwen, Philadelphia; Herbert Coppell, John T. Terry, Jos. S. Dale, New York; W. E. Stavert, D. U. Newton, Montreal; Thomas Gibson, Toronto; J. Frater Taylor, and W. C. Franz, Sault Ste. Marie, Ont., and A. H. Chitty and James Hawson of Sault Ste. Marie, Ont.

At the meeting of the Board of Directors following the stockholders' meeting, the undermentioned officers were elected: — W. K. Whigham, Chairman of Board; J. Frater Taylor, President; Herbert Coppell and W. C. Franz, Vice-Presidents; Thomas Gibson, Secretary; Alex. Taylor, Assistant Secretary; A. H. Chitty, Treasurer.

Recent experiments on the flow of air through smooth sheet steel ducts varying in size from 12 in. to 48 in. diameter, at velocities ranging from 1,000 feet to 2,400 feet per minute, appear to show that the average value of the coefficient of friction is 0.00035.

HOLDING THE APPRENTICE.

FAR greater consideration must be given to the holding of apprentices now than was necessary in the early days of engineering, says J. D. Smith, in the "Machine Tool Engineer." It was the general rule then to bind all the apprentices for a term of years by indentures, the parents often being compelled to pay a varying sum of money according to the number of branches of the trade they wished their son to learn. This plan has become nearly extinct, the apprentices being engaged in the ordinary way as required, just the same as fully fledged workmen, although many firms have special methods of dealing with them during their apprenticeship period, some giving a bonus for every completed year, providing a good report is given by their foreman, while others offer inducements such as free entrance fees to evening classes to all those who complete the session course and sit for the examination.

Apprenticeship Systems.

According to the various reports published in the United States engineering papers, one well-known firm of machine tool makers having instituted a system in which the apprentices are engaged by a man specially allotted for the purpose, he also watching their conduct in the shops, and giving them a shift either to a better class of work or to a different department, according to their capabilities or desires, the respective departmental foremen having nothing whatever to do with them apart from giving them their jobs.

This may be right from the management point of view, but it is absolutely unfair to the foreman to hold him responsible for the economy and output of his department if he does not control the means whereby it is obtained. As regards who should be employed in his department he, above all others, should have the deciding voice. It is not inferred that by classing apprentices as " the means " they should be regarded as machines and not as human beings. The human element holds a most important place, and must be considered seriously when any question is raised regarding shop management and methods in connection with bodies of apprentices and men. No apprentice should be dismissed before being called into the office by the foreman and the trouble discussed. Apprentices are not by any means angels in disguise, neither are foremen, but assuming always, of course, that the foreman is a fair-minded man, and is actuated, as he should be, by the thought of what is fair both to his employers and to the apprentice concerned, he should have the power to use his discretion in the matter of either engaging or dismissing the apprentices.

There are always those who enter a department only to find out afterwards that they are entirely unfitted for that particular branch. The best way to overcome this difficulty is to have it perfectly understood before an apprentice starts that in the event of his being unfitted for that particular branch he will be allowed—within a certain time, of course—to apply for a transfer to another department, his transfer to take place as a vacancy occurs. With regard to changing them from one class of work to another, the foreman is the one best fitted to decide when the apprentice is entitled, by reason of his diligence and capabilities, to a move to another machine or bench, their daily connection giving him a far greater insight than one possibly could have who was working the system from an office and controlling the system in every department.

A System With Merit.

I have yet to come across a fairer system than the one which was in force during my apprenticeship days, and I have endeavoured to carry it out to the best of my ability in each shop I have had charge of since, although different parts of the country necessitated slight modifications to suit the district, one country district necessitating the payment of railway fares from the nearest town, on account of the small number of apprentices available in the village, thus bringing the wages paid on a level with those obtained in the town. The firm was a large one of 2,000 hands, the system being in force in every department, no exception being made under any circumstances. It was perfectly understood when the apprentice started that he would be dismissed on attaining the age of twenty-one years; also he must be fourteen years of age, but not fifteen, when starting.

The first rule had the great advantage of automatically making vacancies, the apprentices being arranged as far as possible in half-yearly steps, each getting a move up every half-year, thus making it necessary for us to learn all we possibly could during the time we had at each particular step, as the time once passed could never be regained. The only exception to this rule was in the event of an apprentice continually absenting himself without leave, or continually misbehaving himself during working hours, when the next apprentice following would step over him, and would eventually get the benefit of a longer period at the last and best stage, the culprit never attaining that last step on account of always being one behind. This was very rarely resorted to, excepting when it was absolutely necessary to keep discipline, the fact of the possibility of this occurring having a good effect on the general conduct of the apprentices as a whole, and I am sure the percentage of good men turned out under these conditions will compare very favourably with those turned out under any other system.

Another rule was that one-fifth of the weekly wages was retained by the firm until the apprenticeship was completed, $2\frac{1}{2}$ per cent. compound interest being then added, and the total amount handed to the apprentice, with a letter stating the length of apprenticeship and the experience gained.

One of the reasons given by the American firm for starting their system was that it was said that the foremen did not take any interest in an apprentice who was naturally more backward than his fellows. As regards this, and I think others will support me from their own experience, the more backward an apprentice is, the more interest a foreman is compelled to take, especially if the previous apprentice was of a high order of intelligence, as the less interest he takes so the production will drop in proportion, and if the foreman is worthy of his post at all he will take particular pains to make each different operation quite clear to the apprentice from time to time, knowing that the decreased results from not doing so are a reflection on his capabilities as an organiser and foreman.

CONCERNING INTERNAL COMBUSTION ENGINES.

CARBON deposit in the cylinders and valves of internal combustion engines has always been one of the great disadvantages of this class of motive power, and this is emphasized in the case of the automobile motor because of the frequency with which it is necessary to take down cylinders and remove the valves.

A way of removing this deposit without the necessity of removing such parts has come recently into use. The apparatus employed consists of a tank of oxygen with appliances of such a nature that all parts of the motor can be reached after opening a valve cap or sometimes only a spark plug. When the nozzle is inserted in the opening, the carbon is ignited by means of a taper as soon as the gas is turned on. The deposit is burned away from the metal very rapidly, and, as soon as all the carbon is consumed, the combustion automatically ceases since the gas has had no effect after the cylinders and valves are clean. The metal parts, it is stated, are not affected, and only a few minutes are required to burn away all deposits even when very heavy.

Drill Jig and Fixture Design and Construction

By H. R.

The sketches and data will, the writer hopes, appeal to machine shop superintendents, designers, toolmakers, and novices, as indicating the large place jigs of every kind and for every service occupy to-day in machine shop practice.

THIS article is a continuation of that on clamping methods and devices. There are many ways of clamping down work, and many types of screws and clamp levers. With the demand for speed there has come into vogue a series of levers with which, by pressing down a handle, it is possible to hold down work with rapidity and accuracy, great pressure being also applied. These arrangements can be employed on most types of jigs and fixtures, but are best adapted for use on machined work where the variation is very slight.

To refer to the illustrations, Fig. 95 shows what is called a cam lever for pulling up. This is used in connection with another series of levers. Fig. 96 shows a design of cam lever for pressing down. There is a correct and an incorrect way of designing these cam levers. If they are not made correctly they will always be a source of trouble. The right way to figure them out is shown by Figs. 97 and 98.

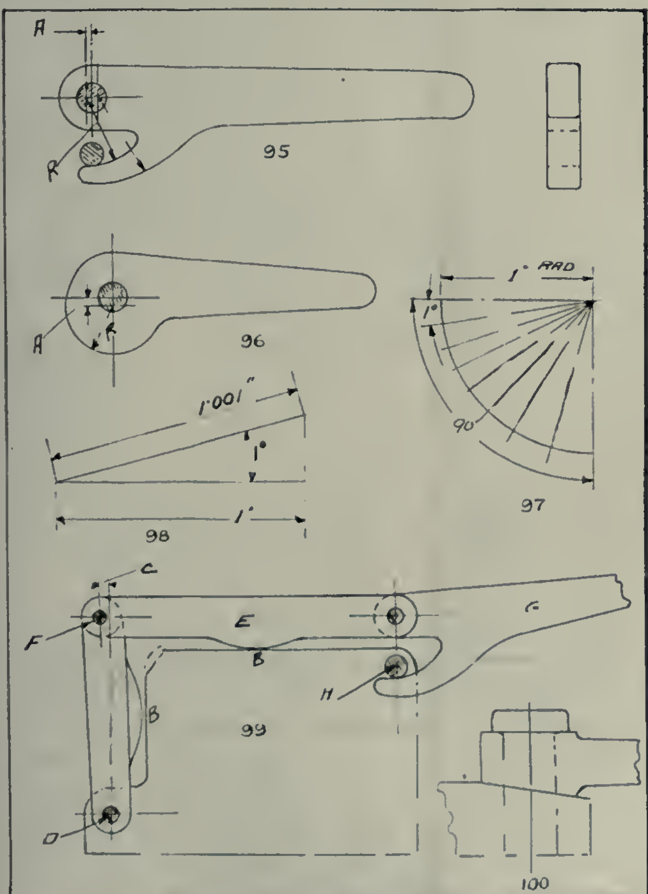
For every degree at 1 inch radius the latter must be out of center .001 of an inch, or as shown at (A), therefore, in designing a correct cam for gripping, you have 90 deg· of gripping surface, and (A) equals 90 plus .001, equals .090 of an inch. If a 2 inch radius cam is required, then (A) will equal .002 of an inch for every degree, or for a 3 inch radius cam (A) will be .003. The formula is not only good for these lever cams, but for straight tapers or wedges, Fig. 98, etc.

Fig. 99 shows a very good arrangement of levers. It will be seen that same can be made so as to grip in two places (BB), or they may be so arranged to pull down on more faces. Referring to the arrangement, Fig. 99, the back link or lever is fulcrumed on pivot (D). A cross lever (E) is fastened to this back lever by a pin (F), and on to the end of this cross lever (E) swings the cam lever (G). The distance (C), referring again to the illustration, should always be about 1-32 of an inch out of the vertical plane of the lever, as this gives a better and more natural pulling action. Very great care should be taken with regard to the pulling down fulcrum (H)· The length of the cam lever should be about 4½ times the radius.

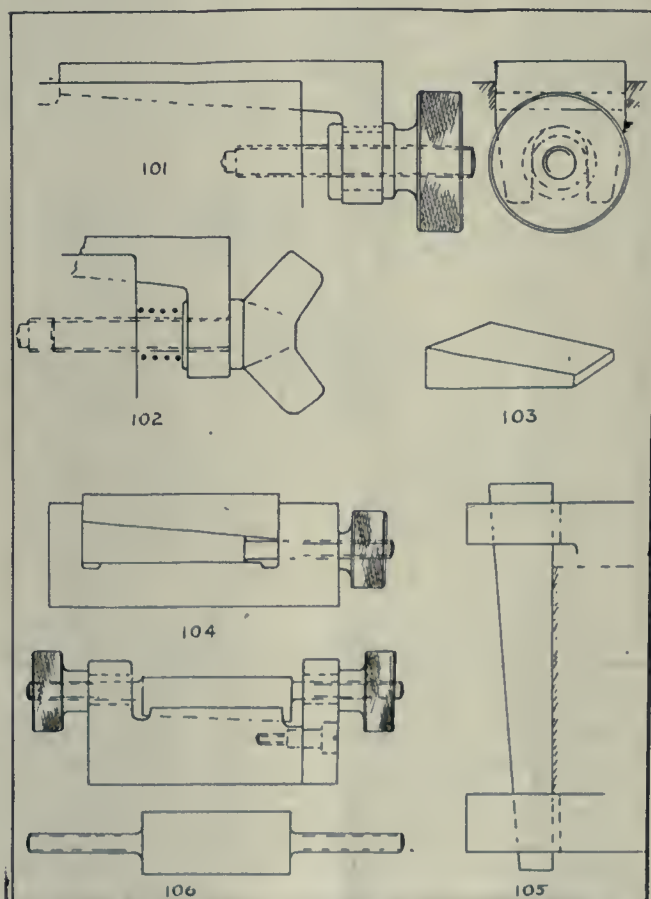
Fig. 100 shows another cam proposition. This is simply a lever with a cam formed on the face, and pulls down with great pressure.

Fig. 101 is a method of pressing on to surfaces by pushing a plate upon a taper surface. In drill jig work this method of clamping will be found very convenient in closed-in places, where it is almost impossible to get other levers or screws. Particular interest should be taken in the construction shown. The operating screw is all self contained. It will be readily seen that this works on a stud screwed into the jig. When this has become worn it can be replaced at little expense. For convenience of fitting, a slot is cut into the adjusting piece. This gives an up and down motion, as same is screwed. If more bearing surface is required, an elongated slot can be made. It will also be noticed that the adjusting nut will work the clamp either way.

In Fig· 102 is shown another adjusting method. The screw is threaded into the jig and the spring releases the clamp.



DRILL JIG AND FIXTURE DESIGN AND CONSTRUCTION.



DRILL JIG AND FIXTURE DESIGN AND CONSTRUCTION.

The method is not good practice, however, because when the screwed hole and screw get worn they are hard to replace.

Fig. 103 shows a common wedge which will be found very useful in jig work, and it is well to have a quantity of these always in stock.

Fig. 104 depicts a way of adjusting a surface vertically which will be absolutely parallel. The illustration shows a set of two wedges self-contained. This arrangement is good for milling machine work, but can be equally adapted for drill jig work.

Fig. 105 shows a wedge pushing a component up to its correct face for drilling. The taper for these wedges should be about 12 degrees or less.

Very often a component has to be located by its ends, as shown in Fig. 108, or by inset bosses. A hardened steel piece is screwed and dowelled in position. This has a vee milled in the end which locates the piece to be operated upon on one end. To locate the other end, a similar vee is cut into a sliding piece. Referring to the illustration, this sliding piece is pushed into position by a screwed nut, and is held from rising by two screws working in two elongated slots. Another method is employed for adjusting the sliding piece either way. A groove is turned around the nut. Into this fit two pins with the sliding piece, thus enabling this to be drawn back or pushed forward easily. The method reduces the distance between the jig and the turned down end of the sliding piece.

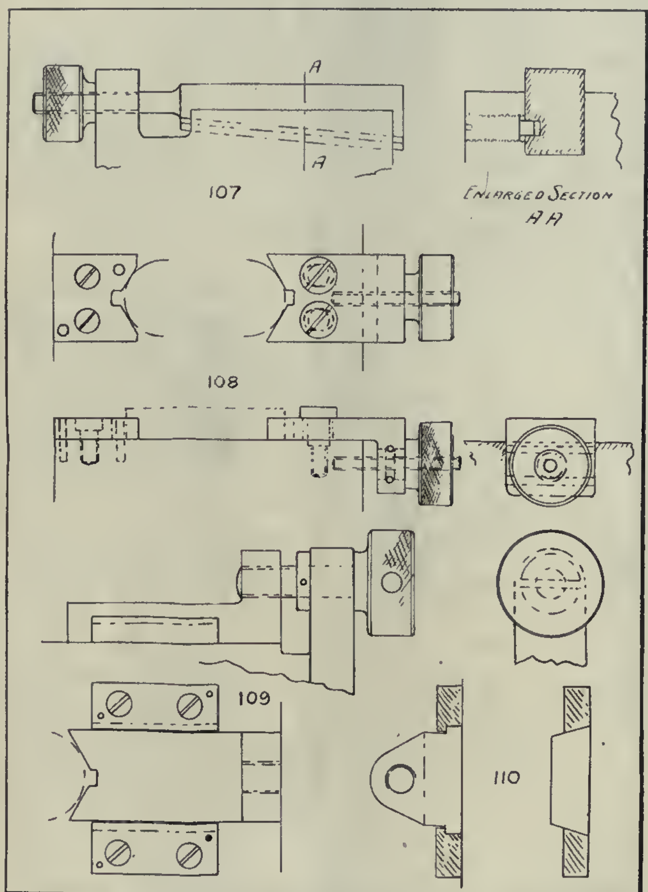
In Fig. 109 is shown another way of making these sliding pieces, being held in position by two steel pieces fitted on either side, so that same may slide between them.

In the sections Figs. 110-110a are two of the best ways of making the side pieces, and perhaps it would be as well to remind the designer with reference to screwing pieces on to other parts of a jig or fixture, that care should be always taken about dowelling pieces. This not only squares up a job but takes any strain off the screws. It is always best, if possible, to use taper dowells, as the taper wedge pulls up the work better than ordinary straight pins.

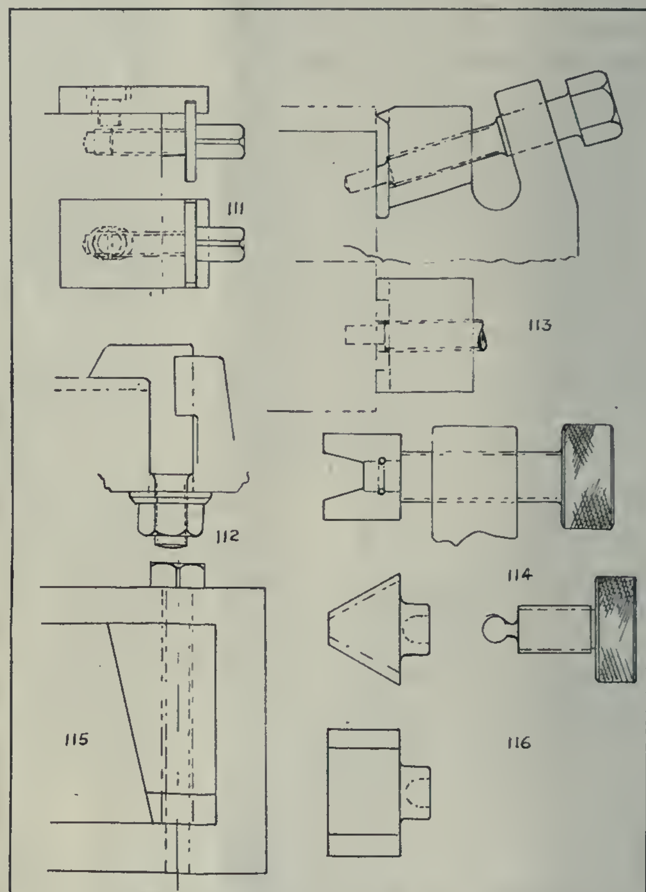
Fig. 111 is another method of adjusting a sliding piece, and very cheap.

Fig. 112 shows the correct way of using hooked bolts, and it will be noticed that the back portion of the bolt is backed up. This is usually done on the casting of the jig. It would be as well to always bear this idea in mind when adopting these particular bolts for clamping down purposes, that there is sometimes required a motion that will not only push the work up to a given face or point, but will also hold the component down firmly. A very good method of doing this is shown. The screw adjusts the clamping piece forward on a taper. As this slides on the taper, it not only presses the component firmly toward its locating piece, but pulls down on to the work. To do this successfully two projecting pieces must be sharpened off, as shown in the illustration.

Figs. 114, 115 and 116 are other designs of wedges for locating purposes that may be useful.



DRILL JIG AND FIXTURE DESIGN AND CONSTRUCTION.



DRILL JIG AND FIXTURE DESIGN AND CONSTRUCTION.

Fig. 106 shows another wedge design. This is operated by two adjusting screws and moves in a machined slot. One end is screwed and dowelled in position, which facilitates the machining of the slot, and enables the wedge to be put in position very easily. Sometimes it is necessary to have these adjusting wedges working on a top surface.

The arrangement shown in Fig. 107 is a very suitable device. It will be noticed in the views shown and section, that a slot is cut the length of the wedge. Into this is screwed a grub screw with a rounded end, which keeps the wedge from falling out when turned upside down.

Contract for Wharf.—A contract was let at Cabinet Council on October 3 to the firm of MacFarlane, Pratt & Hanley for a wharf at Victoria Harbor, to cost $15,124.40.

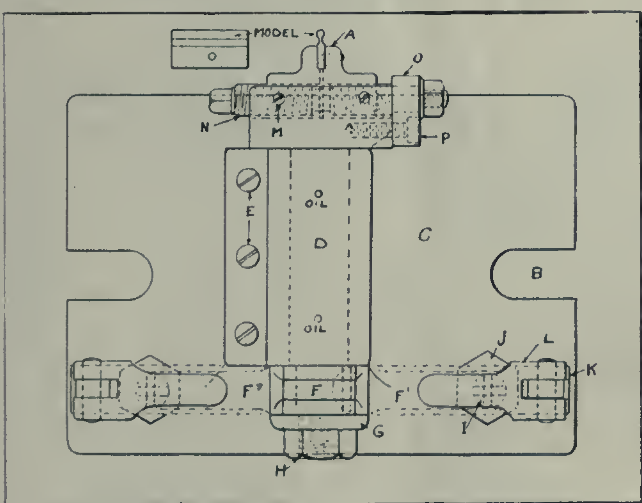
MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

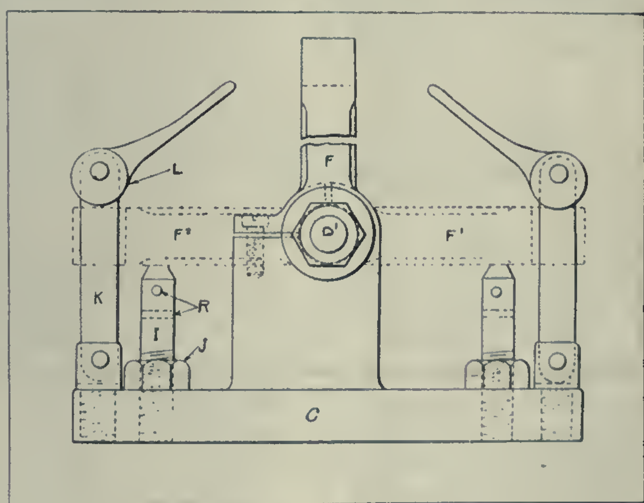
AN EFFICIENT MILLING FIXTURE.

By. A. L. Monrad.

MUCH has been done of late years in the way of developing reversible attachments for milling machines. Most of us are familiar with the flat machine vise and we put a great deal of dependence upon its being parallel, for the quality and accuracy of interchangeable machine work. From that we have improved to the present stage of reversible vise with a perfect adjustable attachment for parallelism. There are, however, some fixtures of this nature on the market which do not possess the quick reversible action necessary for small accurate work. As a number of these fixtures must be in service every day the year around, I shall, therefore, give a brief description of how one was designed and which proved a great success in milling parallel, as well as tapering small delicate pieces of different shapes and dimensions only by changing the sliding jaws (A).



AN EFFICIENT MILLING FIXTURE.



AN EFFICIENT MILLING FIXTURE.

Detail Features.

The fixture is placed on a platen of a hand milling machine with power feed and very close to the head of spindle, to allow the cutter to be short and stiff. The form cutter must run very true sideways, in order to retain its circular shape when milling. Two bolts hold the fixture securely in position through the T grooves in the machine bed and the slot (B) of the fixture. No keyways are provided in the bottom of this fixture, because it has to be changed from taper parallel milling very frequently, and as it has to be set absolutely square, the following method is employed with great success:

Clamp a long parallel piece either round or square in the sliding jaws (A). Place an indicator on the milling arbor between two bushings. Now indicate on the front side parallel piece by sliding the table to and fro, or reversing the jaw vise over in the stationary position. A very slight variation will be shown immediately, and tapering the fixture over half the distance shown on indicator will bring it parallel, when milling a fixture square with the spindle. The fixture plate (C) is made of gray cast iron and finished all over. The spindle hole (D) must be bored exactly parallel with the bottom and square with the front. A 1-16 inch slot is cut through on one side, and the tap is held down to a good bearing surface with three cap screws (E). Both the front and back surface are squared off to a parallel surface bearing. Two oil holes are provided on top for lubrication. The back end of the fixture keyed and fitted.

The arm (F) is secured stationary to the spindle with a washer (G) and a hexagon nut (H), while arm (F) is made of tool steel, slotted, hardened and drawn to a dark straw color. Arm stops (I) are located on each side and directly under the centre of arm (F), when it is extended out. These stops are screwed in the cast iron plate (C), and are held with a hexagon check nut (J), At each side of the stop pins are located the extension cam arms (K). The lower end is screwed down to the shoulder in the cast iron. A tool steel link is pinned in both ends with a free swinging motion, and on top is placed a cam handle (L).

Throwing cam arm (K) out of the slot releases the spindle (D) to be reversed to the other side. The spindle (D) is made of tool steel, with a good bearing fit on both ends. A dowel-tailed slot is milled on the head of spindle about ½ inch deep and ½ inch wide to fit the tool steel jaws (A). A gib is held on one side with two centre screws (M) for adjustment, and is made a snug sliding fit. The jaws (A) are made of tool steel hardened and drawn to a dark straw color. Some of these sliding jaws are fitted with an extra jaw or interchangeable jaws held with two screws. They are thicker to accommodate different shapes of interchangeable work.

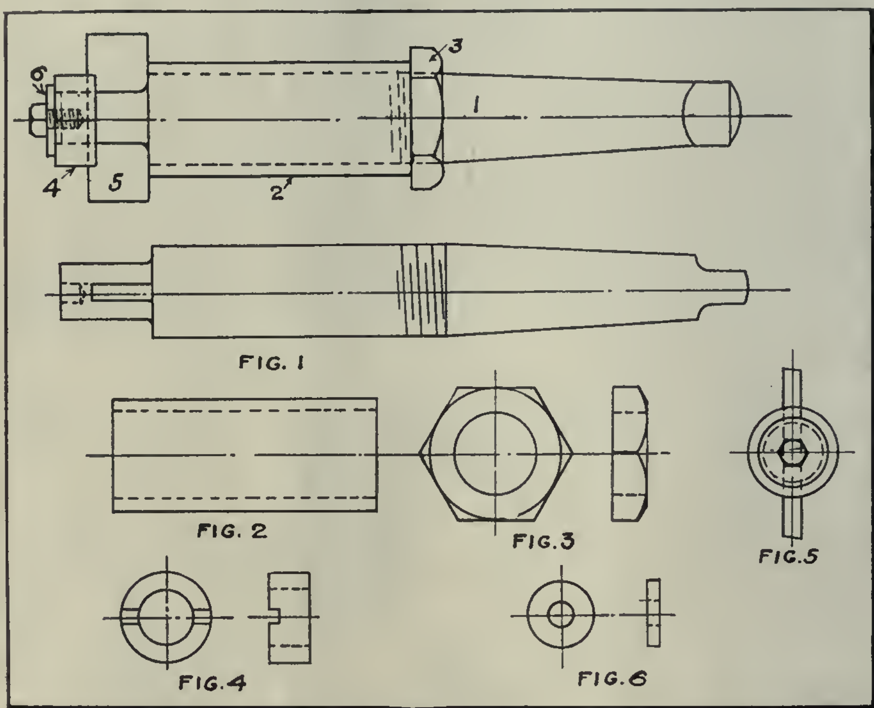
Through the centre in the dowel-tailed jaw is fitted a solid right and left hand square thread screw (N). This is made of machinery steel and case-hardened. One end is milled square to fit a socket wrench, while the other end turns in a tool steel extension piece (O), which is held stationary to the spindle head with two machine screws (P). On the other end of screw (N) is fitted a washer and hexagon nut (Q) turned to a shoulder for a good turning fit of screw (N) in the hole of the piece (O). A socket wrench on the square end of screw (N) closes and opens jaw (A).

The fixture is shown with the arm vertical to illustrate it clearer. The dotted lines (F1) and (F2) represent the attachment in a locked position and ready for the milling operation. The reversing action of this milling fixture is very rapid. By throwing the cam to one side you, at the same time reverse the spindle and throw in the cam on the other side. A very fine adjustment can be attained by turning the stop pins (I) up or down, leaving a rod in the holes (R).

A COUNTERBORING TOOL.

By H. Womersley.

A GOOD service appliance in the machine shop is the counterboring tool. There are various designs in general use, but that here illustrated has been found by the writer to be second to none when it comes to a question of removing material. Fig. (1A) shows a general view; Fig. 1, the bar; Fig. 2, the bush; Fig. 3, the lock nut; Fig. 4, the hardened steel guide; Fig. 5, the cutter; and Fig. 6, the washer.



COUNTERBORING TOOL.

ECONOMIES IN THE DRAFTING ROOM.

By E. W. Tate.

THE lettering on a pencil drawing should not consume too much time, but, nevertheless, should be plainly legible, for in many shops the pencil drawing is often sent into the shop, from which the workman must receive his information. The writer has found, however, that when it is desirable to put a pencil drawing into the shop, a coat of white shellac applied will preserve the drawing. With regard to making drawings directly on tracing cloth or bond paper, this practice may be allowable in some cases; but as pencil drawings have to be sent to the pattern shop, and as it is well known that owing to the shrinkage of blue prints, they are unfit for pattern work, unless all parts are fully dimensioned, which would necessitate another waste of labor, wherein the pencil drawing can be scaled, such drawings would hardly be suitable for pattern or forge shop use.

Other economies which have been found quite valuable are as follows:—

In layout or assembly work, cross sectioning is more quickly done, and the component parts more readily determined by the detailer and tracer if the several parts are lightly shaded with colored crayons. A considerable saving can also be made if the tracing cloth is purchased, cut to desired size, and all standard parts of the title form, except the specific title and skeleton material blocks, printed, thereby not only saving the tracing time, but having the advantage of all titles of uniform style and size.

Tapped holes and standard cap or set screws can be dealt with by a note rather than drawing the complete screw, as is done on a great many drawings.

MOTOR ARMATURE MISHAP.

THE September issue of Vulcan contains a picture of an armature in very bad condition. It is—or rather, it was—the armature of a 55 horse-power series wound direct-current motor, driving haulage gear in a mine. The motor and haulage gear were situated in a small chamber in the mine, but for some reason which is difficult to explain, whilst the motor was working at full load, and, therefore, at normal speed, the band at the back end of the armature burst. Apparently the engineer lost his nerve, and without thinking of the consequence, immediately threw out the clutch, so removing all load from the motor, and then rushed out of the engine-house.

The motor being series wound, as soon as the load was thrown off, the speed increased, and the centrifugal force caused not only the armature windings to fly, but also the commutator spider to burst. When the engineer returned, the machine was a complete wreck, bits of the commutator were lying all over the floor, the armature windings were twisted, whilst the field coils had been damaged by the loose ends of the armature windings catching against them.

Upon further investigation it was discovered that the shaft was bent, and that the core plates of the armature were loosened. It was found possible to utilize the carcase of the machine, but the field coils had to be entirely rewound, and a complete new armature and commutator with shaft fitted. Had the man opened the switch, all this trouble would have been saved.

THE SMOKE NUISANCE.

IN almost every city, especially where manufacturing industries are attended by large volumes of smoke, the problem of abating the so-called smoke nuisance has proved not easy of solution. In many of the methods used for clearing smoke, a "point" or "edge" electrical discharge is used. A discharge of this kind is not uniformly distributed about the point or edge. The discharges cause a slight pressure in the gas, and the smoke or fumes always seek that part of the apparatus where the discharge is weakest or entirely non-existent.

A writer in the Scientific American has made use of a corona type of discharge, and has thus obtained a perfect radial symmetry of the discharge about the electrode. The negative corona is found to be more suitable since slight changes in the position of the corona electrode do not greatly affect the symmetry of the electrical discharges. It is probable that this form of discharge is the most efficient application of the electrical method of removing fumes, smoke and dust from gases.

The use of 300 watts will clean 800 to 1,000 cubic feet of the densest kind of smoke or fumes per minute, with a very small energy loss. The cleaning can be done by passing the gases through 4 ft., or even less, of the corona discharge. The voltage is about 28,000.

DEVELOPMENTS IN MACHINERY

A Record of New and Improved Machinery Tending Towards Higher Quality and Economical Production in the Machine Shop, Blacksmith Shop or Planing Mill.

MILLING MACHINE IMPROVEMENTS.

THE unit system of construction now generally adopted in machine tool design has opened the way for further economic developments, and a step has been taken by the Oesterlean Machine Co., Cincinnati. Ohio, in their new designs of cone type millers. which they style "Ohio" model, embodying the following points:—

The large table and table mechanism of the "Plain" type machines has been adapted to the "Universals," and is now being used on the "Plain" and "Universal" alike. The entire knee and knee mechanism is made identical for both; in fact, instead of building the "Universal" millers of entirely different dimensions from the "Plain," there is only one machine to build which may be made "Plain" or "Universal" by employing or leaving out the swiveling saddle. It is readily understood that a large saving is thereby effected both from the jig expense standpoint and that of manufacturing in larger quantities.

In the "Ohio" millers a unique belt shifting device is applied, which makes it safe for the most unskilled operator to care for the changes of speed rapidly without fear of bodily injury. One complete turn of the hand wheel on the machine runs the belt from the centre of one step to the next consecutive step on the machine cone, and a simple lever carrying a straight line motion link places the belt in desired position on countershaft cone. By this method, the required speed is obtained instantly without making any intermediate changes.

"Ohio" millers are supplied with a cone, the smallest step of which is so near in size to the largest that it approaches constant horse-power for a given countershaft speed. The back gear is eccentrically mounted on a shaft below the spindle in the column, and the gears being cut with single purpose cutters run silent under all conditions. The spindle is supplied with continuous lubrication from oil wells cast in the column.

The method of positive driving the arbor is obtained by means of a recess across the nose of the spindle, and being alike on a number of sizes makes all cutters and tools on these sizes interchangeable. Automatic flooded lubrication set up by the gears revolving and dipping in oil is the method employed for lubricating the entire feed box mechanism. All gears and shafts in gear box are hardened and ground, and run in bronze bearings. These machines are built in five sizes plain and five sizes universal, our illustration showing the latter.

"OHIO" MODEL CONE TYPE MILLER.

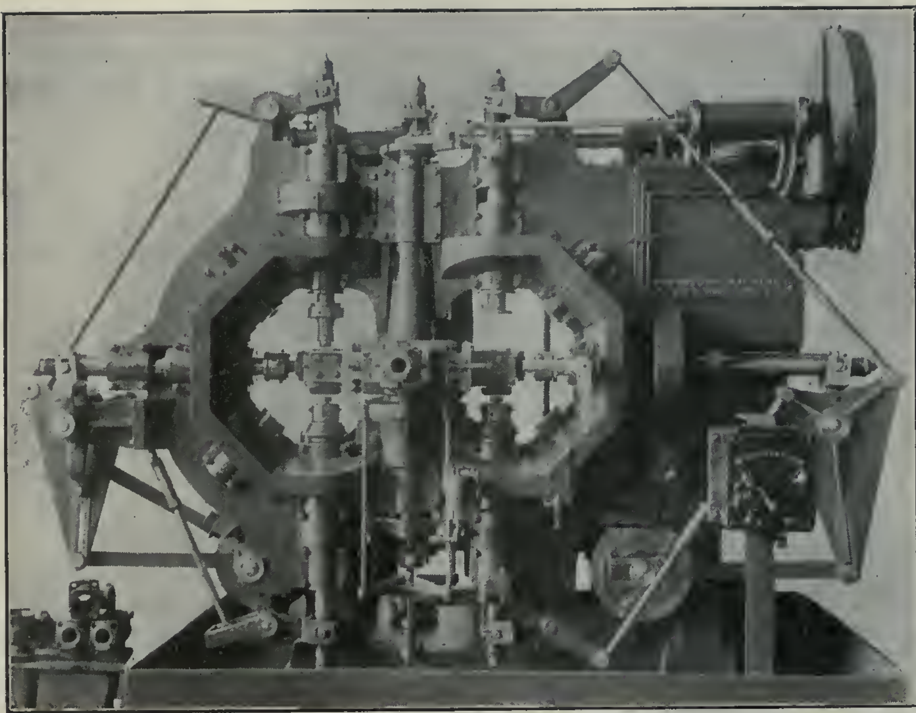
AUTOMATIC VALVE TAPPING, REAMING AND SEATING MACHINE.

THIS machine is intended for finishing semi-steel ammonia valve bodies, flanged and screwed ends, also split return bends and similar work requiring two or three operations in one chucking. The machine is of the upright type, of heavy construction, and would be styled a semi-automatic. A strong feature is the rigidity of the parts, entirely eliminating the shift of work while under operation. The machine is equipped with eight spindles, of which one or all can be used as required.

The turret is revolved and indexed by a pneumatic cylinder, and has four sides provided with four chucks, three of them being under operation, while the fourth is being filled. The first operation is on the left, where the three roughing tools enter the valve, removing all scale surfaces. On the second movement of the turret, this valve comes under the finishing tool, which is located in the rear, but does not show in the cut. Two spindles are provided in the rear, one horizontal and one vertical, providing a finishing tool for either style, whether angle or straight through valve. On the third position of the turret, the two facing tools finish the male and female openings. On the fourth movement, the turret is brought around to the loading point, where the finished fitting is removed and the new blank inserted.

On the right hand side is furnished an additional wrist plate, cam and lever mechanism. This is the tapping side of the machine. It is possible to throw the automatic reversing mechanism out of commission, making the spindles travel in one direction only, which permits placing finish facing tools in these spindles for flange work. The cut shows the machine operating in this manner. By disconnecting the wrist plate, placing lead screws on the spindles, and throwing the reversing mechanism in commission, the machine is ready for tapped openings. While the turret is held and indexed by a substantial latch bar, it is further held by an automatic gripping device, which makes it absolutely rigid with the main frame of the machine, insuring alignment and accurate work. It is possible to revolve the turret entirely around without the tools operating on the work as long as the cam trip has not been pressed down. After the work is placed in the chuck and the turret moved to its first position, the machine passes through the cycle finishing the piece. Once the tools have been set, there is nothing further to be done but to take out the finished work and put in the new blanks. The machine is adjustable in every needed way, covering all ranges of work, from the largest to the smallest.

The chucks, to secure rigidity, are provided with right and left screws that are coupled in the centre with a sleeve to receive the two ends of the screws which have a square to fit this sleeve. The action of the wrench on the one end of these screws is to tighten the jaws on the fitting, which will then cause the screws to separate slightly in the middle, and bring up solidly at each end of the chuck. Therefore, when the work is fastened in the chuck, it is as solid as the turret itself.



4-INCH AUTOMATIC VALVE TAPPING, REAMING AND SEATING MACHINE.

Solid taps are used, and the taps are fed in by adjustable lead screws. In order to facilitate gauging, the leader nuts are castellated and, with a spring latch, the nuts can be revolved from one notch to another, regulating the depth of thread. The lead screws are removable, and can be readily changed for different pitches. The taps are started automatically by the cam shaft, but the reversing is done by the stop on the reversing discs. Any depth of thread can be cut by simply adjusting the stops. The variation in the threads is adjusted by the lead screws, as previously explained.

This machine has many advantages, the first being the construction of the machine itself. With the four-sided turret, the work is brought closer to the operator, giving him every chance for thorough chucking. The simplicity with which the machine can be set up for doing the different jobs is also a great advantage. In starting on a piece of work the turret can be moved back and forth to the different tools, thus doing all the trying and gauging on the first piece. The machine performing the third operation is a feature entirely new. For the machining of a globe valve body, it provides roughing tools to take off the stock and rough reaming, and finishing tools for accurately finishing all the openings, including the seat, with one chucking. As a consequence, it is obvious that the work will be better, the tools last longer and require less setting up.

All gears are made of cast or forged steel with cut teeth; all clutches are made of tool steel, hardened; spindles are of special spindle steel, and are provided with taper sleeves and bushings for taking up wear; all bearings are of ample width and provided with oil grooves and oil holes conveniently placed; and all working parts are arranged with a view to obtain quickness of operation, a feature much to be appreciated The hand levers for the various movements of the machine are placed conveniently at the front, while the output depends upon the material and the tools used. On 2-inch semi-steel valve bodies the output obtained is 20 per hour, with smaller sizes proportionately greater. The floor space oc-

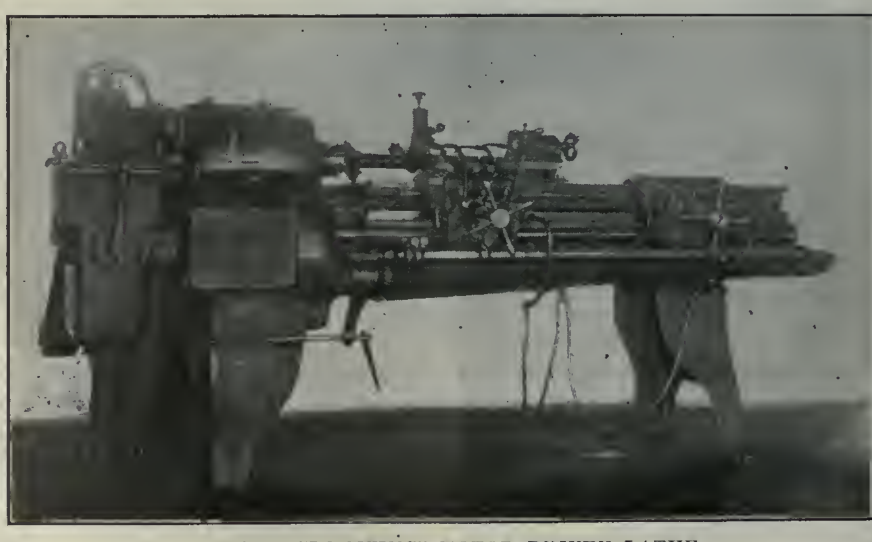


FIG. 1. "LO-SWING" MOTOR DRIVEN LATHE.

cupied is 9 ft. 6 in. by 6 ft. 1 in., and the weight 20,800 pounds.

The Pottstown Machine Co, Pottstown, Pa., are the makers of this specialty.

"LO-SWING" LATHE TEST.

THE Fitchburg Machine Works, Fitchburg, Mass., recently ran a series of tests to determine the motor horsepower required to turn electric motor armature shafts and the average time per shaft. The shafts, 24 21-32 inches long, 2 inches diameter, were of 0.30 point carbon steel, being what is commonly known as "machinery" steel. The rough diameter of the stock was 2⅛ inches. The record of these tests is valuable, as they indicate the great economies that can be effected in machine shop practice by the use of "single purpose" machine tools developed for repetition work required to be machined in large quantities.

Test Equipment.

The tests were run on a "Lo-swing" lathe equipped with the typical tool rests and turning tools used on this machine for shaft turning. The tool rests of this well-known machine tool are so constructed that there is only one slide between the tool and the lathe bed and, therefore, only one oil film between the bed and the cutting tool. This rigid support for the tool enables the machine to take heavy cuts without chatter. The tool arrangement comprises multiple tool rests, all supported directly on the ways. These tools are adjusted at certain distances apart, depending on the length of the different diameter sections of the shaft being turned.

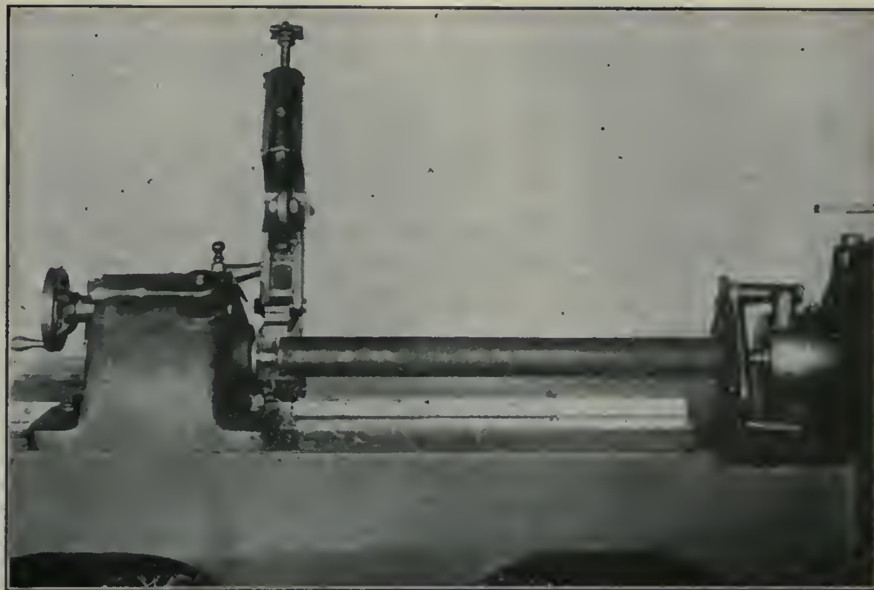


FIG. 2. READY TO START CUTTING WITH FIRST TOOL.

Test Features.

Fig. 1 shows the lathe set up for the test. It is driven by a 10 H.P. Westinghouse motor, running at 1700 R.P.M., mounted on the back of the headstock leg and belted to the constant speed pulley. The controller is in front, convenient to the operator. The readings of power consumption were taken on an Esterline recording wattmeter which makes an autographic record consisting of a series of dots instead of the common unbroken line.

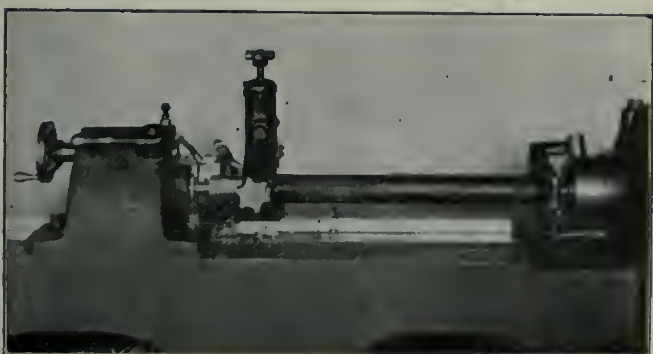


FIG. 3. READY TO START CUTTING WITH SECOND TOOL.

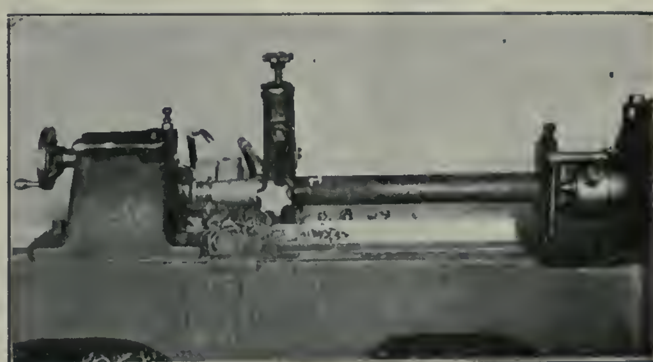


FIG. 4. READY TO START CUTTING WITH THIRD TOOL.

To have produced the turned shaft on an engine lathe would have required eight distinct operations. With the "Lo-swing" lathe the cuts on each end are taken progressively, four diameters being turned simultaneously when the tool cutting the smallest diameter goes into

FIG. 5. READY TO START CUTTING WITH FOURTH TOOL.

FIG. 6. SHOWING FOUR CUTS FINISHED.

TABLE I. DATA ON SHAFT TURNING.

Tools Cutting	Depth of Cut, Inches.	Metal Removed per minute, Cu. Inches.	Time Required per Cut, Seconds	Motor H.P.
No tools cutting..	0	0	0	1.2
Tool 1	0-94	4.26	174	3.1
Tools 1 and 2....	3-64	5.54	122	4.2
Tools 1, 2 and 3..	1-16	7.14	106	5.2
Tools 1, 2, 3, and 4	1-16	8.62	52	6.3

TABLE II. DATA ON SHAFT TURNING.

Tools Cutting	Dept of Cut, Inches.	Metal Removed per minute, Cu. Inches.	Time Required per Cut, Seconds	Motor H.P.
No tools cutting..	0	0	0	1.2
Tool 1	1-32	1.00	127	2.0
Tools 1 and 2.....	5-32	5.54	107	3.8
Tools 1, 2 and 3..	1-32	6.36	60	4.8
Tools 1, 2, 3 and 4	1-32	7.14	43	5.6

action. The work speed was 250 r.p.m., or 131 lineal feet on the 2 inch diameter, while the feed was 50 turns per inch. The power required to overcome the friction of the motor and machines was 1.2 h.p., and when the first tool went into operation the power consumption rose to 3.1 h.p., the depth of cut being 9-64 inch, and the amount of metal removed 4.26 cubic inches per minute. When the second tool began cutting, the power consumption rose to 4.2 h.p., the metal removed then being 5.54 cubic inches for both tools. The progression of cuts and the corresponding power consumption and total metal removed per minute is given for one, two, three and four tools in Table 1, while Table 2 gives the corresponding data for the turning operations on the other end of the shaft. The time required for the first multiple turning operation was 2 minutes and 54 seconds, and for the second multiple turning, 2 minutes and 6 seconds. The total time required for turning five shafts, including the changes, was 35 minutes and 20 seconds, or an average of 7 minutes and 4 seconds per shaft. The shafts, of course, were rough-turned, the finishing being done on the grinding machine.

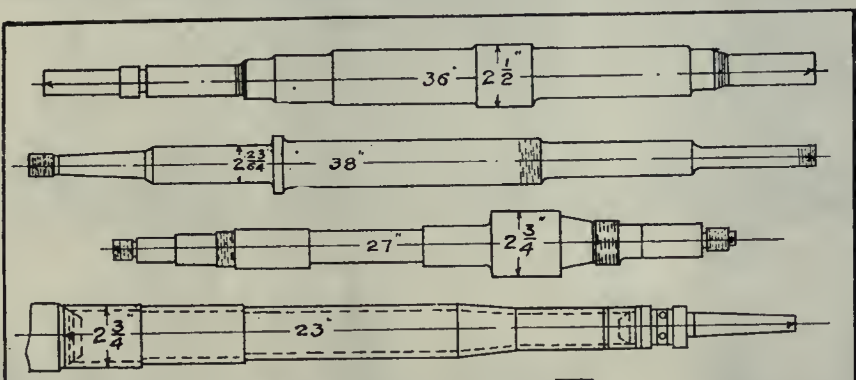


FIG. 7. SHAFT SUBJECTS TYPICAL OF "LO-SWING" WORK.

The foregoing is a typical example of work for which this single purpose tool is adapted, and the use of single purpose tools should become more general as their advantages over general purpose tools are more fully appreciated.

Lathe Features.

The Lo-swing lathe specializes on turnwork up to 3½ inches in diameter, and 90 per cent. of all shafts having several shoulders and one or more tapers are within this limit. Special features relative to the operation of this machine are: Constant speed single pulley drive; automatic measuring device; automatic taper attachment; continuous flow of cutting compound on as many tools as are in operation; two carriages, one or both of which may be used, depending upon the length of the work; the swivel drive with double tail dog for high speed work on heavy cuts; the use of several tools cutting at one time; construction which prevents "chattering," and preserves the cutting edge of the tool; ease and simplicity of operations.

The "Lo-swing" lathe is made in 3 lengths of bed, 60 in., 84 in., and 108 in. between centres. The all-geared head runs in an oil bath; there is an all-gear feed; the gear pump and piping will supply compound to 6 cutting tools, the swing over ways is 4⅞ inches, and the swing over the carriage (to turn a rough bar) is 3½ inches.

H. W. Petrie, Ltd., Toronto and Montreal, are the Canadian selling agents for the Fitchburg "Lo-swing" lathe.

FATAL BOILER EXPLOSION AT COLLINGWOOD.

A FATAL explosion occurred at Collingwood on the afternoon of September 23, W. and F. Shell were at the Blackstock farm looking at a threshing machine, boiler and engine, which they thought of buying. The Blackstock brothers, Edward and Neil, raised steam to demonstrate the fitness of the boiler, when the steam reached 80 pounds, the boiler suddenly exploded, tearing in two about the middle. One part shot forward about 25 feet, and the other backward about 45 feet over the fence into an orhard. Edward Blackstock was struck by the latter part and died a few minutes later. His brother was severely injured, but will probably recover. The Shell brothers were unhurt though standing close to the side of the boiler when it exploded.

Winnipeg, Man.—The ratepayers on October 1 carried the by-law providing for an expenditure of $13,000,000 for a new water supply. Work will be started on the proposition at once. The water will be piped from Shoal Lake, near Kenora, Ont.

TRADE AND COMMERCE RECORD

Dealing With the Steps Being Taken and Progress Made by Industrial Canada To Achieve and Maintain a Dominant Place in the Markets of the World

ECONOMIC EFFECTS OF PANAMA CANAL.

GREAT interest was taken at the Birmingham Meeting of the British Association on September 17, in a paper read by Adam W. Kirkaldy, Professor of Finance, Birmingham University, on the economic effects of the Panama Canal, in the course of which he treated the subject with great thoroughness.

Prof. Kirkaldy said that such effects could be easily exaggerated. So far as the outside world is concerned, he said, the greatest effect of the opening of the canal will probably be to get commerce and trade out of the groove, and cause an all-round moderniz..tion of business methods. The old will have to be scrapped, friction among the factors of production will have to be eliminated, and capital and labor in competing countries will have to learn to work harmoniously together. Socially and economically this will effect a very great result. Is it what America dreamed of when she entered upon this stupendous undertaking?

Two-fold Effect.

The author of the paper is a recognized authority on economic questions. In his address he treated his subject under the two general heads of local effect and effect on world-trade. From the industrial point of view, he said, three questions arose; who shall supply certain markets, who shall perform the service of transport, and what routes shall shipping take. The principal factors on the balance of advantages on which the foregoing questions would be decided were, distance; tolls on the route; freights and the possibility of continuous freight-earning; fuel stations; insurance rates; the political factor; rates of exchange; investments of capital and banking facilities; the human factor — manufacturing and commercial ability, experience of trade and markets, and present possession.

Local Effect.

The canal, he said, will add enormously to the commercial facilities between the various regions of the American continent and the adjacent islands, hence important developments may be expected. The West India Islands will enter upon a new period of prosperity, especially when the internal combustion engine takes the place of steam and oil replaces coal. English business and fiscal methods will have a great effect on making the West Indies important to shipping, and thus assist the development of local industries, especially the export of raw material. The comparatively unprogressive states of Central and South America will undergo remarkable developments owing to increased immigration of Europeans and increased trade. These local benefits will be the chief, and ample, justification for the construction of the canal.

Effect on World Trade.

Of the effect on world trade, he continued: America realizes the importance of the coal trade to the United Kingdom, and there will be a strenuous attempt to displace British coal throughout the world, in order to give American shipping the advantages at present enjoyed by British. If successful this will deal a mortal blow at Britain's mercantile marine. Thus, the British coal industry must realize the situation, and both the capital and labor interested resolve to hold the market at all costs until the fuel question—coal or oil—is finally settled.

The Tolls Feature.

The published scheme of tolls, which frees American coasting ships, raises an international question. If the canal be worked on business principles, higher tolls will be exacted from other shipping. This will either cause a grievance or decrease the tonnage using the canal. The question might be made domestic instead of international, if America charged equal tolls to all, and gave bounties to such shipping as it wishes to favor.

The Distance Effect.

As to the effect of distance, he thought that on Australasian and Far Eastern markets it would be considerable, as the mileage run by a steamer was a serious factor in cost of service. In this, shipping offered a contrast to railways, for when trucks were loaded, length of haul had but litle effect on cost of service.

Taking London and New York as the typical European and American ports, he said, the markets of the world fall into three classes—

(1).—Countries in close proximity to the canal; here the effect will be greatest and, in many cases, the use of the canal a necessity.

(2).—Australasia and the Far East. At present there is a choice of routes to these markets; Panama will offer another alternative.

(3).—Ports not directly affected.

Class 2 is receiving most attention from those estimating the effects on world trade. There is a parallel equidistant from London via Suez, and from New York via Panama. On the South Coast of Australia this is Port Lincoln, Adelaide being the nearest great port. All Asiatic ports west of Japan will continue to be nearer London, e.g., Manila will be 2,000 miles nearer, but all Japanese and New Zealand ports and all Australian ports east of Adelaide will be nearer New York. If it costs 50 cents to transport one ton of goods 1,000 miles, distance saved will give American manufacturers an advantage of from 50 cents to $1.80 per ton on all goods supplied to ports between Melbourne and Wellington, N.Z.

Differs From Suez.

Panama differs from Suez in the matter of tolls. Suez had an immediate monopoly; with Panama there is in many instances a choice of routes and high tolls will deflect tonnage.

Freights.

To benefit American shipping, freight must be available both out and home. To benefit American manufacturers, freights must be low. At present Europe supplies Australasia with manufactured goods, and the shipping goes via Suez. This route gives a maximum of trading possibilities and great facilities for coaling. The Cape route, too, offers to fully loaded steamers the advantage of cheap bunker coal. For the homeward voyage from Australasia a partly loaded steamer goes via the Horn to pick up cargo at ports like Monte Video. The canal would not attract these ships.

When Panama is open, will all-round-the-world services be organized? Great Britain is in a better position to do this than any other country. The rumors current recently that an existing shipping combine was trying to arrange an amalgamation with one of the oldest Far Eastern shipping companies were probably due to the hope of being able to commence such a service, having some of the chief trades of the world as tributaries, from the moment that Panama is available. America hopes to open up new markets, e.g., wool. This now concentrates at London, but there is a tendency towards decentralization, and if America develops the woollen industry, she will get a wool market without necessarily constructing a Panama Canal.

Fuel Stations.

This will be one of the decisive factors, and lead to the keenest commercial rivalry. The American Government are planning to supply good coal at either end of the canal at 19s per ton. The English coal on the Suez route is at present much dearer; to maintain the Suez route in its integrity, the supply of cheaper coal is a necessity. When oil replaces coal, the British Empire resources will be ample to maintain our commercial position, but this must not in the meantime be placed in jeopardy, or disaster may ensue.

The Political Factor.

The working of the Imperial idea in Great Britain, America and Germany should be noted. Preference granted by the Dominions has materially assisted British trade. The possession of the Philippines has displaced Spain from the position of chief trader there in favor of America. The importance of this factor can be traced in the case of Japan, and China, when settled government comes, will be another notable instance.

Rates of Exchange.

The Far East has a silver, Europe and America a gold standard. Rates of exchange effect trading relations. The whole question should be carefully studied. About seven years ago, when a Chinese merchant could get exchange on the West Coast of America at the rate of 119 taels for $100 gold, it paid him to import thence timber and flour; but at present rates—namely, 160 taels for $100 gold, this ceases to be profitable business, and he can trade to greater advantage locally. This factor works independently of trade routes.

Investments and Banking.

Great Britain is a great creditor nation. Her advances have been really made in goods, and though the interest has to be paid in gold, it comes in goods covered by bills in terms of sterling, so that investors get their interest in gold. The British, too, have banking establishments all over the world. London is the great settling place for international trade. All this gives England a very great advantage. Germany has followed England in this.

Finally, the Englishman is, roughly speaking, the man in possession, and though at one time he seemed somnolescent, at present he is very wide awake. He has many advantags for the transport services; cheap, economically worked ships, also carefully organized trading facilities throughout the world, and the knowledge and experience which enable him to retain old trades and be the first to enter new ones.

So far as retaining the markets for manufactured goods is concerned, he has an unrivalled labor force endowed with hereditary skill. He can get the pick of the raw material, thanks to his knowledge of markets, and a fiscal policy which favors England as a buyer of raw and semi-manufactured materials.

Finally, British goods are known all over the world for their quality. Honest goods and honorable dealing on the part of the seller are their own market.

"MADE IN IRELAND" TRAIN.

THE Canadian Associated Press understands that a "Made in Ireland" train, under the auspices of the Irish Chamber of Commerce, is about to tour the Dominion. Specimens of Irish manufacturers will be transported from Belfast to Quebec by way of the Empress steamers from Liverpool. At Quebec, a C. P. R. train, consisting of ten sample cars, will be fitted up with exhibits, and sent for a trip over the three transcontinental railways, as far as Calgary, returning via Montreal and St. John, N.B. At the latter port, the exhibits will be reshipped for Liverpool and Belfast.

The round trip, it is estimated, will cover about 12,000 miles, and will take up from 75 to 80 days. Arrangements have been made with the C. P. R. that the cost of each car shall include all expenses of the entire trip from and to Belfast, including maintenance charges for the four attendants allowed to each car.

PROGRESS AT PORT NELSON.

WORK at Port Nelson, the terminus of the Hudson Bay Railway, is progressing rapidly, and the Department of Railways and Canals have succeeded in placing there enormous stores of equipment and supplies necessary to carry out the plans. These latter call for a continuation of the work all winter, so that when the Hudson Bay Railway is completed, facilities at the terminus will be adequate to care for the immediate traffic.

Two hundred men are now at work, and will continue all winter. They are engaged in building quarters, docks, storehouses and railway yards. Supplies already forwarded are all that are necessary for the work. They include locomotives, steam shovels, timber, rails and other material necessary for railway or dock construction.

Vessel Service.

Early in July the Government tugs Kathleen and Neophyte left for Port Nelson and will remain there on the work. The steamers Belleventure and Buonaventure also left about the same time carrying supplies, men and machinery. The Belleventure has returned, and is again going north with a cargo of coal, accompanying the dredge Port Nelson, built in Toronto, for work in Port Nelson harbor. At noon, Friday, September 12, the Department of Railways and Canals was notified by wireless that they had reached a point about 150 miles east of Belle Isle Straits, after having had very severe storms from Cape Breton to Gaspe and through the Straits of Belle Isle. The Buonaventure left on its second voyage on September 17 with a cargo of equipment and supplies. She will be the last steamer sent north this season. A powerful tug purchased in Glasgow, Scotland, sailed for Hudson Bay on September 6th, and is expected in Port Nelson in a few days. A number of barges to assist in the dredging have also been sent into the bay and arrived there successfully.

Two steamers, the Alcazar and Allette, sailed from Port Arthur, Texas, on July 15, carrying 4,000,000 feet of Southern pine to be used in construction of docks and wharves. This timber is especially adaptable for the work owing to its durability. The cost was also less than if obtained inland, as the continuous water transportation made freight charges very light. These steamers are now unloading at Port Nelson. The steamer Serence carrying coal, and the Sinbad, loaded with machinery, are also unloading at Port Nelson, and are expected to return about October 1st.

In all ten vessels have successfully navigated the Straits without an accident, and two of these are making a second voyage. This in itself is the best of evidence as to the feasibility of the route, but it is much stronger when it is considered that the safeguards to navigation are not so numerous as on the older trade routes, and that the voyage was the first into these waters for most of the officers of the vessels engaged in this work.

Wireless Communication.

To secure communication with Port Nelson, a wireless equipment was shipped on one of the steamers, and is now geing erected, when communication will be established with Le Pas, the starting point of the Hudson Bay Railway, where a similar wireless station is nearly completed. By this means the Department of Railways and Canals will be in close touch with the work at Port Nelson at all times.

Next year work will commence on a rapid transfer elevator to handle the grain which will seek the European market on the opening of this route.

SOO CANAL ENLARGEMENT.

As a preliminary to the enlargement of the Canadian canal at Sault Ste. Marie to a depth of 31 feet, the Government is arranging for the expropriation of Whitefish Island, and an additional strip of land along the south side of the present canal. Most of the property is owned by the Algoma Central Railway, and the Department of Justice is now instituting expropriation proceedings. Although there was no vote passed at the last session of Parliament for this purpose, the Minister of Railways and Canals, Hon. Frank Cochrane, is taking prompt action to secure the land when it can be got for a comparatively small amount, and before contemplated investments by private parties are made. thus rendering the property more valuable. The actual work of enlarging the canal must, of course, wait until sanctioned by Parliament, but it is understood that a vote will be asked at the next session for a preliminary survey and for the preparation of plans.

The Next Step.

The enlargement of the Soo Canal is a logical sequence to the enlargement of the Welland Canal. The next step will be the enlargement of the whole St. Lawrence canal system so as to give a continuous thirty-foot channel right through from the head of the lakes to the Atlantic. That is the big scheme which Hon. Frank Cochrane is reported to have in view, and which the Government, it is said, will adopt. The formal announcement of the whole scheme will probably not be made for some considerable time yet, but meanwhile the enlargement of the Welland and the Soo Canals will be proceeded with.

STATE REGULATION OF CANADIAN FREIGHTS.

Mr. W. B. NOBLE, of Cairns, Noble & Co., has contributed to the Newcastle Daily Journal a decidedly interesting article on the subject of Canadian freights. To begin with, Mr. Noble recalls the fact that some two years ago the Dominion Government approached the British Board of Trade in connection with the proposal to institute a system of State regulation of the adjustment of ocean rates of freight between this country and Canada. The proposition, he tells us, does not appear to have found very much favor with the Board of Trade, but that Department expressed a willingness to co-operate in any investigation or inquiry which the Dominion Government might think fit to institute. That, of course, is exactly the sort of thing the Board of Trade would do, although it must be admitted that in this particular instance their peculiar methods have been all for the best.

We do not want Governmental regulation of rates of freight. Such a system would be as grossly unfair as Governmental regulation of the price of newspapers.

The H. L. Drayton Investigation.

Mr. Noble goes on to say that an investigation has been carried on by Mr. H. L. Drayton, K.C., chairman of the Canadian Railway Commission, but it is not quite clear as to whether this gentleman is acting on behalf of the Dominion Government or conducting an inquiry of his own. According to Mr. Noble, the individual who is making most trouble is the Canadian flour miller, who declares that he cannot obtain a price in this country which will give him a fair return and make milling in Canada a profitable business. It is alleged that the steamer rate on flour is excessive as compared with that on wheat, and in this connection Mr. Noble gives it as his opinion that "very little difficulty would be experienced in justifying a differential of 60 cents per ton."

Another point, he states, which is exercising the Canadian mind is that all benefits under the preferential tariff are said to have been destroyed by the high rates demanded by the steamship lines on west-bound goods, and he then gives the following table, showing the approximate value per freight ton of the preferential tariff according to a few of the chief articles of value imported into Canada:

	Value.	%	Preferential. s. d.	Rates 1910 s. d.	Rates 1912 s. d.	Inc. s.d.
Woollen goods	£ 90 per 40 c. ft.	5	90 0 per 40 c. ft.	27 6	30 0	2 6
Cot. piece goods	80 "	5	80 0 "	22 6	30 0	7 6
Carpets	50 "	5	50 0 "	20 0	25 0	5 0
Felt Hats	30 "	7½	45 0 "	15 0	20 0	5 0
Cutlery	150 "	7½	225 0 "	25 0	35 0	10 0

Still another question, says Mr. Noble, is that of tramp tonnage, merchants in the Dominion complaining that such tonnage is now a negligible quantity, and that they are in the hands of a monoply wielded by the conference lines. Surely it is time that this silly old grievance was abandoned by merchants. So far as those in the Dominion are concerned, Mr. Noble very pertinently points out that if they wished to charter a tramp for the carriage of their goods, they would have to pay a rate 8 to 10 per cent. higher than that charged by the regular lines, and also that they would have considerably more stringent terms in the charter-party, and would probaly be mulcted in higher insurance rates.

What the merchants—not only in the Dominion, but in other parts of the world as well—want is, of course, an entirely open freight market, coupled with the regularity and other benefits conferred by the conference system; or, to put the case more forcibly, they want to have matters all their own way. It would be rather interesting to know, though, how some of them would have been placed during, say, the last two years or so, if the "monopolies" of which they complain had been non-existent, and the entire shipping trade of the world had been subject to the fluctuations of the freight market.

Proceeding, Mr. Noble sets out three proposals which have been put before the Dominion Government. These are: (1) that ocean carriers should be treated as, and, if necessary, legislated into. the position of common carriers; (2) that the Canadian Government should form a fleet of vessels of their own for the conveyance of East-bound produce and West-bound merchandise; (3) that powers under the three-mile limit of territorial jurisdiction should be exercised in connection with steamers trading to Canadian points. We are entirely at one with the Newcastle shipowner when he remarks that it is incredible that these suggestions could for one moment be entertained by any body of right-thinking men.

Railroad and Steamship Comparison.

"It would appear," he continues, "there does not exist in Ottawa a sufficiently clear conception as to the economic difference between a railway and an ocean-going steamship line." True, and a similar lack of comprehension is to be found in many other quarters; yet the situation ought to be plain enough to any man gifted with a normal amount of reasoning power. Mr. Noble goes on to state the entire case in all its details. He points out that a railway company's capital has been mainly employed in preparing the ground and laying the track; that it cannot be removed from the district which it serves, and that accordingly it becomes, in a sense, a part of the country itself. When a railway company, he says, receives a charter to put its line through a certain district it obtains a monopoly, and it thus becomes incumbent upon the Government to see that that monopoly is not abused.

A steamship company, on the other hand—we are summarising Mr. Noble's remarks—has, in reality, no monopoly at all. A competitive line may at any time be established. Moreover, "with very few exceptions, steamship rates are regulated by the laws of supply and demand—that is to say, should a line or number of lines in conference together agree on a rate altogether out of proportion to the value of the goods, it would be impossible for any traffic to move, and, automatically, the rate in question would cease to exist for all practical purposes. The result would be that a fresh rate, which would give a just and proper share of the profits of the transaction to both parties interested, would come eventually into existence." There is, of course, nothing very new in these arguments, but they are so convincing as to bear repetition.

The State Service Idea.

With regard to the idea of a State service, one may safely put this suggestion aside as utterly futile and silly. Neither the Dominion Government nor our own is likely to embark on such a proposition. It is becoming quite the fashion nowadays for traders who cannot make their own terms for the sea-carriage of their goods to cry out loudly for a State-owned line of steamers, but whether they expect the cry to be responded to is another question. The absurdity of the demand becomes apparent enough when one follows it out to its logical conclusion. If a Government is to come to the rescue of distressed shippers by providing a line of its own, it ought naturally to extend a similar helping hand to everyone else who claims that he is being overcharged. When the price of bacon becomes so high that the householder shudders at the sight of that commodity, the State ought at once to set up in the bacon-curing industry. When butchers' meat becomes so dear that Mr. Lamb's weekly bill is a thing of terror, the State ought to open butchers' shops all over the country. This, at least, is the natural sequence to the merchants' and shippers' demand for State steamship lines. —Syren & Shipping.

LARGE CAPACITY LOCOMOTIVE BOILERS.

THE necessity for providing a boiler of large capacity in the locomotives employed in heavy main-line service is becoming increasingly apparent, states the Railway Gazette, and the ratio between boiler capacity and cylinder volume, although of the first importance when designing a locomotive, is not necessarily the determining factor when settling the dimensions which the boiler and fire-box shall have. In order that there may at all times be a sufficiency of steam for all probable requirements, it is desirable that the boiler should be of such a size as to allow of sufficient space in which to generate steam to be held in storage or reserve for any emergency call that is likely to be made upon it.

This is the basis of at least one successful locomotive design employed on one of the railways running north of London, England, the engines having comparatively small cylinders, but very large boilers and ample heating surfaces and grate area. These locomotives are never known to run short of steam, but it was necessary, in order to give them these large capacity boilers, to utilize the 4—4—2 wheel arrangement in place of the 4—4—0.

The opinion has been expressed that, under the increasingly arduous conditions which locomotives on British main lines are now being called upon to face, the 4—4—0 wheel arrangement hardly lends itself favorably to the development of boiler design, except where super-heated steam is employed, and there would seem, concluded our contemporary, to be very good ground for holding this opinion.

CINDER CONCRETE.

By W. L. C.

WITH every succeeding year, the utilization of reinforced concrete for building purposes of every sort is becoming more and more general. Both from experience with actual constructions and through the employment of tests, engineers are able to foretell how the various forms of the material will act under different conditions. Moreover, in the field of fireproof construction of buildings, concrete stands preeminent, with regard to durability, economy, and fire-resisting qualities. Many interesting facts have been brought to light with regard to the manner in which concrete withstands fire, and the investigations along these lines have been thorough and far-reaching.

Fireproof Floors.

The use of cinder-concrete in fireproof floor construction has been growing in popularity from day to day. Objections to the use of this material have been advanced, in view of the fact that in some cases where it has been used, piping for the sprinkler systems or for other purposes has been corroded to such an extent as to be rendered useless. For this corrosion the cinder-concrete has been blamed. However, it has been demonstrated that, if the cinders are not new, are free from sulphides, and that if the mixture consists of one part of cement to ten parts of cinders, with enough sand to make a dense mixture, there is little or no danger of the corrosion of water piping.

A recent fire, water and load test, carried out upon cinder, terra-cotta and gypsum floor arches, showed that the first-mentioned material was the best of the three. A fire was kept burning continuously below the floor for a period of four hours, and during that time the floor was subjected to an average temperature of 1700 degs. F. At the end of the four hours, a fire stream was turned on the roof, while it was still red hot. The floor load during the test was 150 pounds per sq. ft.

The cinder-concrete suffered very little damage, and the test served to furnish an additional proof that this material is an excellent fire-resisting medium.

REDUCE OR ABOLISH DUTIES ON MACHINERY.

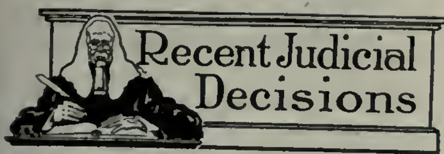
MR. BEN. MORGAN, discussing the all-important question of Canadian freight rates in The Financial News, London, England, on October 1, declares that the Dominion Government has the remedy in its own hands. One solution, he maintains, could be found in the reduction or abolition of the existing Canadian duties on British machinery, steel and iron girders, and heavy goods of that class.

Such a concession to the Motherland need not affect more than six to eight items in the Canadian tariff, but it would undoubtedly attract a considerable volume of British goods to Canadian ports, and assure a considerable freightage in the direction of Canada.

Assuming that the British consigner paid three dollars per ton on this freight, says Morgan, the return freight would be very much lower, and would be all in favor of the Canadian producer. The effect of the assuring of a given volume of freight towards cheapening the return freight is one of the commonplaces of shipping practice. Great Britain does a larger trade in exactly this class of goods with Argentine, and takes in return, year by year, a very considerable amount of River Plate wheat.

MOTOR SPIRIT FROM PEAT.

PEAT may now come to the front as a commercial source of motor spirit, as it has at least been found practicable to get rid of the water by mechanical pressure. The basic principle of the press is its sub-division into a series of concentric chambers with porous double walls of metallic gauze, through which the excluded water can escape. The dried peat is then subjected to destructive distillation, yielding the usual range of by-products. The wettest peat bogs can be dredged and turned to account, as there is no occasion to confine operations to the surface or upper sections.



Toronto, Ont.—On the 24th of February last a steel beam attached to a travelling crane in the moulding shop of the Dodge Manufacturing Co. broke without warning, dropping a large iron clad box, weighing 1,650 pounds, upon Charles W. Randall, a moulder employed in the shop. He died shortly afterwards in the Western Hospital.

An action brought on behalf of the widow and infant children has just been settled, the company paying a total of $1,800, besides a certain contribution towards the costs. Notice of trial had been given for the present Jury Sittings. The settlement was approved of by Mr. Justice Middleton in a judgment which orders $1,300 to be paid into Court, to be paid out at the rate of $180 a year, principal and interest combined, for the support of the widow and her two infant children, a boy aged eight and a girl aged six. The balance of $500 is to be distributed by Mr. N. F. Davidson, K.C., in payment of the debts and assisting the widow in paying off a mortgage on her home, 569 Clinton street.

The application of the moneys is an example of the tendency of the Courts to use such moneys as if they were the continued earnings of the workman, instead of setting aside any fixed proportion to be paid to the children when when they come of age.

No satisfactory explanation of the breaking of this beam, which had for ten years carried double and treble the load at the time of the accident, was discovered, notwithstanding a very searching inquiry at the inquest and during the progress of the litigation.

Montreal, Que.—Because a manufacturing concern left a projecting screw on a pulley unprotected, a jury in the local courts recently decided that the company was responsible for an accident which befell a workman, and accordingly condemned them to pay $3,000. Incidentally, to arrive at such a decision, the jurymen passed an opinion on a point of rather more than ordinary interest to manufacturers and others who happen to be interested in the conducting of factories where a number of workmen are engaged. They declared that the Company which owned the machinery in the factory and which, therefore, had the repairing power over such machinery, had such machinery in its care, and this despite the fact that the machines in question were operated under the direct supervision of a contractor who, as head of a department, engaged his own men to operate the machines, paid the men out of his own pocket, and had full charge of the men—of whom the victim of the accident was one. The point will be discussed before a higher court, however, judging by intimations thrown out after the verdict, by the counsel who appeared on behalf of the defendant Company. Judgment in accordance with the verdict has not as yet been handed down by Mr. Justice Guerin, his Lordship postponing such decision until later, when opposing counsel will again appear before the court. It is the desire of the defendants that the law point involved form the subject of further judicial pronouncement, and, to this end, a motion was made that the matter be referred to the Court of Review. It is not unlikely that the case will be brought to the attention of this latter tribunal, and afterwards to the attention of other appellate courts, as it is realized that the matter is one of vital interest to practically all engaged in the manufacturing business. The suit was that of Desparoi vs. Frothingham & Workman, the hearing before the jury having taken up no less than six days. Plaintiff claimed $10,000 damages on account of injuries sustained by his son, a minor, whilst in the employ of one Nantel, a contractor, head of department, who conducted operations in one of the departments of defendant's factory. The boy was badly injured by being caught in a quickly revolving pulley which had a set screw projecting from it. Suit was entered against Nantel under the Workmen's Compensation Act, and against Frothingham & Workman under the common law. In the case of the latter the plaintiff contended that as the firm owned the premises where the boy was at work, as well as the machinery, which was responsible for the mishap, and as the firm had alone the repairing power over such machinery, it alone was to blame because such machinery was defective. The mere existence of such a defect, argued plaintiff, pre-supposed negligence or fault on the part of the firm—such fault or negligence being quite distinct from that (if any), of which the actual employer of the lad might be guilty. The jury fell in with this view. Hence the verdict, as above stated.

Fort William, Ont.—Negotiations for the sale of C.P.R. elevators "A" and "C" to the James Richardson Co. were reported on October 3. The elevators have a capacity of 1,100,000 bushels, and are situated on the Kaministiquia River. It is said that the Company is not willing to sell the land, but will give a lease of it for a long term.

MACHINERY HALL, CANADIAN NATIONAL EHIBITION.

On the subject of the Machinery Hall at the Canadian National Exhibition, held annually in Toronto during the last week of August and the first week of September, the William Hamilton Co., Ltd., Peterborough, Ont., write as follows:

We have your recent favor in reference to the present Machinery Hall at the Canadian National Exhibition. There is no question that manufacturers of heavy machinery who wish to exhibit at the Canadian National Exhibition are under quite a handicap with the present building, as no appliances are there for handling heavy machinery. The building was evidently never built originally for the display of heavy machinery, and it is impossible at the present time to build anything like a permanent exhibit, and, therefore, machinery cannot be shown to very good advantage.

Our own opinion of the matter is that a new Machinery Hall is necessary, and we think that the proper way to build it is on the general lines of a modern, up-to-date machine shop, having an electrical travelling crane running the full length over the centre, in which heavy machinery can be exhibited, and which could be handled and put into place with this travelling crane. The sides could be made in the form of bays, where the lighter machinery could be shown, and no doubt either travelling jib cranes or portable derricks could be used to put this machinery in place. As it is, there is no place now even to hang a chain block, and some equipment for handling machinery is absolutely necessary.

FLOATING DRYDOCK TOLLS.

An Order-in-Council has been passed approving the schedule of tolls to be charged by the Canadian Vickers Co. for ships entering their floating drydock, the Duke of Connaught, at Montreal. The tolls, which are exclusive of charges for repairs, are graduated according to the gross tonnage of the ships, the minimum being $300 dollars for the first day, and $80 for each subsequent day on tonnage up to $1,000.

The maximum is based on a tonnage of 25,000, the entrance charge being $2,750, and the subsequent daily rate, $1,250. Among the regulations, one provides that vessels of his Majesty's navy and vessels in distress involving risk of foundering, shall at all times have priority of docking over all vessels registered in the entry book.

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Vol. X. OCTOBER 9, 1913 No. 15

PRINCIPAL CONTENTS.

CIRCULATION OF "PANIC" REPORTS.

DURING the past week, reports have been circulating in Canadian industrial spheres to the effect that our leading steel and ironworks, carbuilding plants, etc., were on the verge of closing-down through lack of orders on hand. One redeeming feature of the attempt to precipitate a panic in our basic industries, however, was the fact that much of the reports contents were so extreme and of necessity so evidently faked, that, generally speaking, little harm was done or excitement caused. In addition, prompt official denial was forthcoming by those responsible for the industrial undertakings concerned.

While it is true that there are a greater or lesser number of people always ready to throw up their hands when a dipping tendency appears in the natural course of business enterprises generally, it remains to be recorded that there are those in our midst, and comparatively insignificant numerically, who are out for personal gain, irrespective of cost or consequences to those others who constitute the sinew and backbone of our country. The unfortunate thing about the dissemination of panic news, is the fact that it is extremely difficult to trace the culprits to their lair. This class of individual is a menace to the development and growth of this Canada of ours in its every feature, and it is up to our manufacturers and our Captains of Industry—the men who are building up our Nation, to make it known that they not only dis-associate themselves from the panicmonger, but that they will take every legitimate means of combating his despicable work.

Business in our manufacturing enterprises, as in every other sphere of our complex being and relationship will fluctuate, yet, we can train ourselves to take the fall as well as the rise, calmly and preparedly, and with the panic part eliminated, all of us are generally the better for the backward swing of the pendulum.

VICTIMS OF CIRCUMSTANCE.

ONE of the Pilkington Brothers, the well-known British manufacturers of glass who are building a large branch plant at Thorold, Ont., was standing watching building operations the other day, at the same time talking of how the plant came to Thorold, and how other cities missed this big industry. He was referring to a nearby city, which we will call Peachville, and said that but for certain circumstances, the glass factory of Pilkington's, Ltd., would now be building in Peachville. The fact is that when Pilkingtons were looking for land in the Niagara Peninsula, they called at Peachville, but found the industrial commissioner away. Later they ran across this farm at Thorold, which they purchased, and never gave Peachville further thought.

This is no discredit to the industrial commissioner of Peachville, for had he known, he would have striven for it, tooth and nail. The claims of his city were such as could not be passed over as they were by the Pilkingtons, but it shows what trivial circumstances control the gaining and losing of big industries.

GOOD BREEDING VS. ZEAL.

IN these days of extreme competition and slack trade a salesman must be very zealous indeed to land good business. He should never let his zeal override his etiquette. We heard a story this week of a steel salesman who secured a big order from an Ontario manufacturer. The story really concerns two salesmen, but one through too much zeal lost the order. There are three personalities in the case, the third being that of the manufacturer who, because he detested bad breeding, favored the salesman who did not carry his zeal too far. In brief the story is thus: the manufacturer told salesman No. 1 to see him the following afternoon as No. 2 was coming in the morning, then he could compare their prices. No. 1 came in the morning and his visit coincided with that of No. 2. He lost his order by being over zealous.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

	Mont'l.	Tor'to.
Grey Forge, Pittsburg.	.....	14 25
Lake Superior, charcoal, Chicago	.....	14 75
Middlesboro, No. 3....	20 00	21 50
Carron, special	22 50	.....
Carron, soft	22 50	.....
Cleveland, No. 3......	20 00	22 00
Clarence, No. 3	20 00	21 00
Jarrow	.....	23 50
Glengarnock	.....	26 00
Michigan charcoal iron	27 00	.....
Ferro Nickel pig iron (Soo)	.....	25 00

BILLETS.

	Per Gross Ton.
Bessemer billets, Pittsburgh ...	$24 50
Open hearth billets, Pittsburgh.	24 00
Forging billets, Pittsburgh.....	30 00
Wire rods, Pittsburgh	27 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto..	2.10
Steel bars, f.o.b., Toronto........	2.15
Common bar iron, f.o.b., Montreal.	2.15
Steel bars, f.o.b., Montreal.......	2.25
Bessemer rails, heavy, at mill....	1.25
Steel bars, Pittsburgh, future	1.40
Tank plates, Pittsburgh, future...	1.40
Beams, Pittsburgh, future........	1.40
Angles, Pittsburgh, future........	1.40
Steel hoops, Pittsburgh...........	1.60

F.O.B., Toronto Warehouse.	Cents.
Steel bars	2.30
Small shapes	2.40

Warehouse, Freight and Duty to Pay.	Cents.
Steel bars	1.80
Structural shapes	1.90
Plates	1.90

Freight, Pittsburgh to Toronto.

18 cents carload; 21 cents less carload.

IRON PIPE FITTINGS.

Canadian malleable, 40 per cent.; cast iron, 65; standard bushings, 70; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 75; malleable, lipped unions, 65.

NAILS AND SPIKES.

Standard steel wire nails, base..		$2 35
Cut nails	$2 60	2 65
Miscellaneous wire nails.. 75 per cent.		
Pressed-spikes, ⅝ diam., 100 lbs. .		2 85

BOILER PLATES.

	Mont'l.	Tor'to.
Plates, ¼ to ½ in., 100 lbs.	$2.35	$2.30
Heads, per 100 lbs.........	2.65	2.65
Tank plates, 3-16 in.......	2.60	2.55
Tubes, per 100 ft., 1 inch	9.50	8.50
" " 1¼ in.	9.50	8.50
" " 1½ "	9.50	9.00
" " 1¾ "	9.50	9.00
" " 2 "	8.75	8.75
" " 2½ "	11.15	11.50
" " 3 "	12.10	12.00
" " 3½ "	14.15	14.50
" " 4 "	18.00	18.00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Stove bolts	80 & 7½
Machine bolts, ⅜ and less	65 & 5
Machine bolts, 7-16.......	57½
Blank bolts	57½
Bolt ends	57½
Machine screws, iron, brass	35 p c.
Nuts, square, all sizes.....	4c per lb off
Nuts, Hexagon, all sizes..	4¼ per lb off
Fillister head	25 per cent
Iron rivets	60, 10 p c off
Wood screws, flathead, bright	85, 10, 7½ p c off
Wood screws, flathead, brass	75, 10, 7½ p c off
Wood screws, flathead bronze	70, 10, 7½ p c off

National-Acme "Milled Products."

Sq. & Hex Head Cap Screws	65 & 10%
Sq. & Hex Head Cay Screws	65 & 10%
Rd. & Fil. Head Cap Screws	45-10-10%
Flat & But. Head Cap Screws	40-10-10%
Finished Nuts up to 1 in. ..	75%
Finished Nuts over 1 in. ..	72%
Semi-Fin. Nuts, up to 1 in...	75%
Semi-Fin. Nuts over 1 in.....	72%
Studs....	65%

Discounts f.o.b., Montreal.

OLD MATERIAL.

Dealers' Buying Prices.	Mont'l.	Tor'to.
Copper, light	$10 50	$11 50
Copper, crucible	12 50	14 50
Copper, uncr'bled, heavy	12 00	12 50
Copper wire, uncrc'bled	12 00	12 50
No. 1 machine compos'n.	11 00	12 50
No. 1 comps'n turnings..	9 50	9 50
No. 1 wrought iron	10 00	9 00
Heavy melting steel	9.50	10.00
No. 1 machinery cast iron	13 00	14 00
New brass clippings....	8 50	9 00
No. 1 brass turnings....	7 25	8 00
Heavy lead	3 50	4.25
Tea lead	2 75	3.20
Scrap zinc	3 00	3 50

WROUGHT IRON PIPE.

The following are Toronto jobbers' discounts on pipe in effect from April 21, 1913:

	Buttweld		Lapweld	
Standard	Black	Gal.	Black	Gal.
¼ ⅜ in.	62	47	....	....
½ in.	68	58	....	....
¾ to 1½	71½	61½	68½	58½
2 in.	71½	61½	68½	58½
2½ to 4 in. ..	71½	61½	70½	60½
4½ to 6 in. ..	....	....	71½	61½
7, 8, 10 in. ..	....	....	66	54
X Strong P. E.				
¼, ⅜, ½in. ..	56½	46½	....	....
¾ to 1½ in. ..	67½	57½	....	....
2 to 3 in.	68½	58½	....	....
2½ to 4 in. ..	....	....	65	55
4½ to 6 in. ..	....	....	64	56
7 to 8 in.	....	....	55	45
XX Strong P. E.				
½ to 2 in.	43	33	....	....
2½ to 4 in. ..	....	....	43	33

PRICES OF WROUGHT IRON PIPE.

Standard.		Extra Strong.		D. Ex. Strong.	
Nom. Diam.	Price. per ft.	Sizes Ins.	Price per ft.	Size Ins.	Price per ft.
⅛in	$ .05½	⅛in	$ .12	½	$ .32
¼in	.06	¼in	.07½	¾	.35
⅜in	.06	⅜in	.07½	1	.37
½in	.08½	½in	.11	1¼	.52½
¾in	.11½	¾in	.15	1½	.65
1 in	.17½	1 in	.22	2	.91
1¼in	.23½	1¼in	.30	2½	1.37
1½in	.27½	1½in	.36½	3	1.86
2 in	.37	2 in	.50½	3½	2.30
2½in	.58½	2½in	.77	4	2.76
3 in	.76½	3 in	1.03	4½	3.26
3½in	.92	3½in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4½in	1.27	4½in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.86	...	.....
7 in	2.38	7 in	3.81	...	.....
8 in	2.50	8 in	4.34	...	.....
8 in	2.88	9 in	4.90	...	.....
9 in	3.45	10 in	5.48	...	.....
10 in	3.20	....	....	...	.....
10 in	3.50	....	....	...	.....
10 in	4.12	....	....	...	.....

METALS.

	Mont'l.	Tor'to.
Lake copper	$17.25	$16.25
Electrolytic copper	17.25	16.25
Casting copper	17.25	16.00
Spelter	5.50	5.75
Lead	5.40	5.00
Tin	42.50	43.00
Antimony	8.50	9.00
Aluminum	22.00	18.00

SHEETS.

	Mont'l.	Tor'to.
Sheets, black, No. 28	$2.85	2.90
Canada plates, ordinary,		
52 sheets	2 90	3 00
Canada plates, all bright.	4 00	4 15
Apollo brand, 10¾ oz.		
(American)	4 30	4 20
Queen's Head, 28 B.W.G.	4 40	4 40
Fleur-de-Lis, 28 B.W.G..	4 20	4 25
Gorbal's Best Best, No. 28	4 40	4 40
Viking metal, No. 28....	4 40	4 40

MISCELLANEOUS.

	Cents
Putty, 100 lb drums	$2.70
Red dry lead, 5 cwt. casks, per cwt.	6.00
Glue, French medal, per lb	0.10
Tarred slaters' paper, per roll...	0.95
Motor gasoline, single bbls., gal..	0.26
Benzine, per gal.	23½
Pure turpentine	0.60
Linseed oil, raw	0.60
Linseed oil, boiled	0.63
Plaster of Paris, per bbl.	2.10
Plumbers' Oakum, per 100 lbs....	3.25
Pure Manila rope	17

COKE AND COAL.

Solvay Foundry Coke	5.95
Connellsville Foundry Coke	5.45
Yough, Steam Lump Coal	3.93
Penn. Steam Lump Coal	3.63
Best Slack	2.95

All net ton f.o.b. Toronto.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents.

Montreal, Oct. 6, 1913.—Though money is circulating more freely and general manufacturing conditions continue to show a slight improvement, business among the large machinery houses is still very quiet; moreover, there does not seem to be any immediate prospect of better times. Orders for the equipment of the Atlantic Sugar Refineries have not yet been placed, and there is no other important prospect in sight at the present moment.

A sensational report was published last week in a Montreal evening paper to the effect that the Canadian Car and Foundries Co. would be compelled to close down all their plants by Christmas owing to lack of orders. The firm in question at once denied the truth of the report, yet admitting that this winter would probably find them less busy than usual. However, orders at present on the books ensure practically full activity up to the end of the year at any rate. There seems to be a general feeling that the various car building companies have a period of dulness ahead of them; but there is really little ground for the belief. With the ever increasing mileage of our railways, the demand for cars of every type is bound to be a steady one. The Railway Companies at this time do not usually send in many orders, as it is later in the year that their rolling stock is overhauled and new orders placed. However, the late money tightness will doubtless have its effect in lessened orders in the immediate future, not only among the car builders, but also with the locomotive works.

A meeting of the bond holders of the Canada Iron Corporation has been called for October 18th, when a scheme for starting up the foundries again will probably be submitted. It is understood that all the foundries were being operated at a profit at the time of the liquidation, and it is probable, that a short time now will see them in full blast again. The blast furnaces at Midland, Ont., however, were run at a loss, and are not likely to be blown in again for some considerable time.

Pig Iron, etc.

An active demand for winter supplies of English pig continued all last week, several orders of considerable size having been booked. Prices remain firm at last week's figures. Copper remains dull in local circles, with a poor demand. The price made a sensational jump to £74 10s per ton in London last week, but rapidly dropped back again later to its former level. The present state of the market is puzzling speculators considerably. Lead is a shade firmer this week, but spot supplies remain very scarce. Tin is down to $42.50, but this is probably only a temporary set-back.

Toronto, Ont., Oct. 6, 1913.—For some time at least, the United States tariff bill which ecame law last week, will not affect the steel business much in Canada. Some provisions will touch it more than others, and will be felt in different parts of the Dominion. The metal business will see results quicker and bigger than the steel trade. One of the largest metal houses in Toronto stated to-day that they expected to double their business in a short time. Manufacturers who are buying steel just now, with one or two exceptions, are not showing any concern over the new tariff bill. There appears to be plenty of confidence on this side in the Democratic administration; nevertheless, underneath, there is a fear that something might happen.

There are few changes in the steel tariff. The following principal items are now on the free list: Farm implements, cash registers, hoop or band steel cut to lengths, iron ore, manganese, cut nails and cut spikes, railway bars, steel ingots, blooms and slabs, and all barbed wire. Other important products placed on the free list are:—Brass clippings, old brass, Cobalt, copper ore, coal (anthracite and bituminous), junk of all kinds, and tin ore.

Cheaper Steel.

Warehouse steel prices in Toronto are down five cents a pound, due to much quicker mill deliveries. Whereas, in the spring, plates were offered from the mills in three to four months, they can now be secured in from six to eight weeks. In the case of structural steel there is not much difference. The time for receiving steel bars from the mills has shortened from 3-4 months to 1-2 months. These conditions may not last long, however, owing to the large tonnage being booked just now. Local business has been much livelier during the last few weeks. Implement men who did not buy a pound of steel a month ago, are now beginning to make plans, believing that the western farmer will be ready to buy again by the spring.

Machine Tools.

It was stated last week that the order for machine tools to be used in the new plant of the Abitibi Pulp and Paper Co., at Iroquois Falls, Ont., had not been definitely awarded. It is now known that the machine tools have been ordered through Williams and Wilson, Montreal. In the country there are a few scattered orders for tools. Orders have been placed in the city this week for several large lathes and milling machines. The Canadian Copper Co., Copper Cliff, Ont., near Sudbury, have called for specifications for tools to supply their new machine shops, boiler shop, blacksmith shop, and carpenter shop. The list of tools required includes lathes, bolt cutters, several drills, two shears, and steam hammer. For the carpenter shop, there are required saws, planers, moulder, boring machine and surfacer.

Metals.

Among the things allowed to enter the United States free under the new tariff bill is junk of all kinds. This will be good news for Canadian metal concerns. The duty on several virgin metals has also been reduced. Frankel Brothers expect to double their business as a result of the tariff changes. Otherwise, there is nothing to report.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Engineering

Woodstock, Ont.—The Board of Trade sent a deputation to Indiana last week to meet the directors of an iron industry, who are thinking of locating here.

North Battleford, Sask.—W. A. Brown of the Canadian Northern Railway announces that the round house and repair shops here will be increased in size.

Prescott, Ont.—The Dominion Government has purchased a site here for a factory, in which they will manufacture lighthouse apparatus, including fog alarm machinery and structural steel towers.

Ottawa, Ont.—Work on the new C.N.R. shops, which are being erected at Rideau Junction, is progressing. The foundations are now laid, and the buildings will probably be finished early next spring.

Weyburn, Sask.—The Dominion Odic Electric Co., capitalized at $1,000,000, have taken over the Weyburn Foundry and engaged E. J. Lewis as manager. They will install a plant for the manufacture of electrical machinery. Dr. E. M. Gratopp, president.

Exeter, Ont.—An application to the ratepayers for permission to lend $10,000 to the Exeter Mfg. Co., Ltd., will be made on October 18. This company, which is composed of The J. B. Foote Foundry Co., The F. B. Zieg Mfg. Co., and F. B. Zieg, all of Fredericton, Ohio, will acquire the foundry of James Murray & Son, and will establish a plant in Exeter for the manufacture of road-making machinery, cast iron pipe.

Thorold, Ont.—Seventeen carloads of supplies have arrived at Thorold for work on No. 3 section of the Welland Canal. Fifteen dump carts, a steam shovel, an upright engine, along with a No. 3 dinkey and a large amount of timber are also on hand. A switch is being laid from the Welland station yards in order to unload the supplies. O'Brien & Doughney will erect an office, a machine shop and other buildings on the Campbell estate.

Gananoque, Ont.—Damage estimated at $50,000 resulted from a fire which gutted one of the spring factories belonging to the Spring & Axle Co. here on October 1. The loss is fully covered by insurance, placed through Irish and Moulson, of Toronto. Preparations for rebuilding the structure will commence at once. The manager, Mr. Simpson, expects to be operating the plant again at its full capacity within a month. The axle factory adjoining the burned building escaped.

Sault Ste. Marie, Ont.—The Lake Superior Corporation have started work on the construction of a roasting plant for the treatment of siderite ore from their properties in the Michipicoten district. The new plant is being installed on the Company's brick plant property in Steelton, and on the line of the Algoma Central Railway. President Taylor says the cost of the new plant will run up to about forty thousand dollars. About fifty men will be employed on construction.

Hamilton, Ont.—The Hamilton By-product Coke Ovens, Limited, will locate in Hamilton. The plant will be built in units. The first unit will be built on a 33-acre site on the bay shore in the east end, and will consist of fifty ovens, each of sixteen tons capacity, operating on eighteen hours' coking time. A 5,000,000 cubic feet gas-holder will also be erected there. The plant will use 1,000 tons of coal per day, producing 700 tons of coke. Over one hundred men will be given employment at the start. United States capital holds a controlling interest.

Electrical

South Vancouver, B.C. — The city council will go ahead with the building of a civic power plant.

Smith's Falls, Ont.—The Smith's Falls Electric Power Co. have installed a 400 h.p. generator, which w... more than double their lighting capacity.

Alberni, B.C. — The Ritchie-Agnew Power Co. will instal equipment of 250 h.p. capacity, costing $75,000 at Stamp Falls, and later will add a plant of 25,000 h.p. capacity, costing $2,000,000. This is contingent on the town of Alberni agreeing to buy power for 30 years at a little over 2 cents per k.w.h.

Municipal

Port Coquitlam, B.C.—The city will spend $15,000 on fire protection.

St. Mary's, Ont.—A by-law to guarantee bonds of $50,000 of the St. Mary's Flour Mills has been defeated. A 60-barrel mill was to have been erected.

Coldwater, B.C.—George Champe, Toledo, O., civil engineer, has been engaged to prepare plans and estimates of cost for installing a municipal waterworks plant for the village.

Calgary, Alta.—The stock yards by-law, authorizing the issuance of $350,000 in bonds; the industrial housing by-law, providing for the construction of a building for infant industries to cost $250,000, and a by-law providing for the building of a $30,000 tuberculosis hospital, were approved by the ratepayers.

Railways—Bridges

Ottawa, Ont.—The C.N.R. has laid the last rail of its route between Ottawa and Toronto.

Brantford, Ont.—W. P. Kellett states that the Lake Erie and Northern Railway will be in operation between Brantford and Galt about the middle of December.

Montreal, Que.—The Montreal and Southern Counties Railway Co. will open a new stretch of road from Richelieu to Marieville this week, and are pushing the line from Marieville to St. Cesaire.

Montreal, Que.—The Canadian Pacific Railway Co. has had constructed by the American Car & Foundry Co. two cars especially equipped for fire fighting. Each car carries a tank of 8,428 Imperial gallons capacity, and on the end of each there is a 7 x 10 x 10-inch duplex fire pump.

Toronto, Ont.—The Toronto Suburban Railway must proceed at once with the construction of the Pacific Avenue extension. If the City of Toronto is ready in time with the grading of Annette Street, that line must be proceeded with too. This in effect was the decision of the Ontario Railway and Municipal Board in disposing of the pleadings of the Toronto Suburban Railway to be relieved of the work of making the extensions at the present time.

To Complete Alberta Railway.—Premier Sifton announced to the Albertan Legislature on September 22 a final settlement of the Alberta and Great

Waterways Railway case, satisfactory to the Government, the representatives of the Royal Bank, the bondholders, and others interested. J. D. McArthur and his associates, owners of the Edmonton, Dunvegan & British Columbia Railway which is now being completed to Peace River, who also built a large section of the Grand Trunk Pacific, and are now building the Hudson's Bay Railway for the Federal Government, take over the charter, complete the road, and assume all existing liabilities.

Wood-Working

Wyoming, Ont.—Daniel Senecal will start to erect a box and basket factory next week.

Rossland, B.C.—J. S. Deschamp's planing mill was destroyed in a storm on Sept. 22.

St. Catharines, Ont.— The Northern Veneer Co. is erecting a veneer plant here, and expects to have a basket factory in operation by Dec. 1. Mr. Dalton, Grimsby, Ont., is president.

Chesley, Ont.—The Chesley planing mill, owned by Lueck Bros. & Elliott, was gutted by fire on Sept. 29. A quantity of valuable machinery was destroyed. The mill has been closed since last spring.

Ottawa, Ont.— Conveying machinery will be required to replace the sawdust conveyor destroyed by fire at the plant of the J. R. Booth Co., Ottawa. A new timber mill will also be built and equipment for it purchased.

Vancouver, B.C.—The Vancouver Industrial Sites, Ltd., have bought out the real estate holdings of the Imperial Car & Drydock Co., and have purchased a site for $200,000, on which they will erect dry kilns and an additional saw mill.

Marine

Welland, Ont.—Chief Engineer Weller, of the new Welland ship canal, has received word from the Dominion Dredging Co., who have the contract for building the new harbor, breakwater and pier at the canal entrance, Lake Ontario end, that they are bringing their entire fleet of dredges down the lake and will make an early start on the work.

Four more sections will be under contract this year, being Nos. 2, 5, 7 and 8. One will be the section including the large lock north of Port Colborne. The section north of Welland, which requires the removal of the aqueduct and raising the Welland River level will not be let this year.

General Industrial

Wadena, Sask.—The Fibre Co. have appointed directors, and will build a flax mill here.

Listowel, Ont.—The plant of the Maple Leaf Portland Cement Co. of Atwood, Ont., has been closed for the winter.

Vancouver, B.C.—W. Hales Turner, High Elms, Lennox Road, Gravesend, England, is contemplating the establishment of a plate porcelain factory, costing $150,000, in Vancouver.

Rosthern, Sask.—Work has been started at Duck Lake upon the erection of a 75 barrel flour mill by the Duck Lake Milling Co., which is capitalized at $40,000. The building will be 48 x 78 feet. two stories high. The president is Hillyard Mitchell, Duck Lake.

Brampton, Ont.—Builders will start work at an early date on a new paper mill in Brampton. Barber & Colbert is the name of the new firm who plan to erect a two-storey building. Mr. Barber is a son of John R. Barber, a well-known paper manufacturer of Georgetown, and Mr. Colbert is former superintendent of the old Barber mills.

Contracts Awarded

Winnipeg, Man.—The Vulcan Iron Works has been awarded the contract for the steel work on the new $50,000 building for the Adanac Club.

Toronto, Ont.—The contract for the erection of a new isolation hospital for York County at Newmarket, Ont., has been awarded to W. B. Graham, Toronto.

Montreal, Que.—A. F. Byers & Co., of 340 University Avenue, Montreal, are general contractors for the new pattern shop which the National Bridge Co. is having built.

Lindsay, Ont.—The contract for building the Mud Lake Narrows bridge was awarded to the firm of Coates & Jupp, Orillia. The structure is an all concrete one, and will cost about $3,000.

Elko, B.C.—The Elko Water, Light & Power Co. have awarded a contract for the piping of water from Silver Spring Lake for Elko waterworks. An initial outlay of $22,000 is contemplated.

Welland, Ont.—The contract for the construction of the Union Carbide Co.'s plant has been awarded to the Lackawana Bridge Co. of Buffalo. The plant when completed will cost a million dollars.

Welland, Ont.—Clark & Sons, contractors, of Toronto, have secured the contract for rebuilding the Welland Court House, which was damaged by fire June 11, and have started work. The contract price is $16,000.

Welland, Ont.—The contract for the lighting and the power used on the Welland Canal has been given again to the Lincoln Light and Power Co., by the Dominion Government. The renewed contract is to run a number of years, at the same figure as before.

Montreal, Que.—Ross & McComb have been awarded the contract for the concrete sub-structure of a bridge over the Yamaska River at St. Cesaire for the Montreal & Southern Counties Railway. They also have the contract for building the line through Granby, Que.

Ottawa, Ont.—The Department of Marine and Fisheries has completed plans for the construction of the second largest ice-breaker in the world. The vessel is for use on the lower St. Lawrence. The cost is estimated at $750,000. The contract will be given to the British firm of Vickers Sons & Maxim.

Montreal.—The Dominion Bridge Co. has been awarded the steel for the crucible steel plant for the Armstrong Whitworth Co., Montreal. The Whiting Foundry Equipment Co., of Harvey, Ill., has been given the contract for five 5-ton cranes and one 15-ton crane, while the buildings, waterworks, and drainage contracts go to E. G. M. Cape, of Montreal.

Refrigeration

Saskatoon, Sask.—The Saskatchewan Abattoirs, Ltd., capitalized at $200,000, will shortly erect a plant.

Winnipeg, Man.—The Board of Control has awarded the contract for the construction of a refrigeration plant, to cost about $12,000.

Lethbridge, Alta.—The United Farmers of Alberta are interested in a proposition to erect a co-operative pork packing plant to handle 50,000 hogs annually. Secretary, P. P. Woodbridge.

The York Manufacturing Co., York, Pa., makers of ice-making and refrigerating machinery, have recently supplied the following equipment: Manitoba Agricultural College, Fort Garry, Man., one 4-ton vertical single-acting belt-driven enclosed type refrigerating machine and high pressure side complete. Joseph Kilgour, Toronto, Ont., one 4-ton vertical single-acting belt-driven enclosed type refrigerating machine and high pressure side complete.

Ottawa Dairy Co., Ottawa, 3,615 feet of $1\frac{1}{4}$ in. direct expansion piping for bunker coils.

Tenders

Cambie, Richmond, B.C.—Tenders will soon be called by the municipality for the construction of an emergency water main across the Lulu-Sea Island Bridge.

Montreal, Que.—Tenders have been called by the Montreal & Southern Counties Railway for a new sub-power house at Rougemont, Que., and for extensive rolling stock.

Regina, Sask.—Tenders will be received until Oct. 25 for the supply of one 3,000-kilowatt steam turbine with condenser and one hand power crane for 45-foot span. Specifications may be obtained from E. W. Bull, superintendent of the light and power department.

Port Arthur, Ont.—Tenders are now being received for the construction of the plants of the Canadian Conley Frog and Switch Co. The plant will be completed by May, 1914. G. R. Duncan, Port Arthur, are constructing the foundations. The Conley headquarters are in Memphis, Tenn.

Winnipeg, Man.—Tenders addressed to the Chairman, Board of Control, will be received at the Office of the undersigned up to October 16th, for the manufacture, delivery, installation and testing, in the Grand Trunk Pacific shops at Transcona of transformers and switching apparatus complete as per specification. M. Peterson, secretary.

Toronto, Ont.—Tenders will be received by registered post only, addressed to the chairman of the Board of Control, up to Tuesday, October 21, for 20-inch cast iron pipe, 36-inch cast iron pipe, 36-inch and 20-inch stop valves, and 36-inch and 20-inch cast iron special castings. Specifications and tender form for the foregoing may be obtained upon application at Room No. 9, Department of Works, City Hall, Toronto.

Trade Gossip

The Studebaker Sales Agency, Ltd., has changed its name to the York Motors, Ltd.

The Tweed Electric Light & Power Co., Ltd., has reduced its capital from $40,000 to $24,000.

The E. B. Eddy Co., of Hull, Que., have recently installed a 30-ton crane of 50-ft. span, for raising gates at the new power house. This was supplied by the International Marine Signal Co., Ottawa.

Transformer Order. — The Hydro-Electric Power Commission of Ontario have placed an order with the Canadian General Electric Co., Limited, for six transformers, each 3,500 k.w., 46,000-2,300 volts.

Electric Motor Contract.—The Donnacona Paper Co. of Donnacona, Que., has ordered electric motors ranging from 150 h.p. downwards, and aggregating 1,330 h.p. from the Canadian General Electric Co.

Thrifty Mechanics.—A Chatham, Ont. mechanic purchased $1,500 worth of Chatham debentures last week. The "Chatham News" asks why other people do not act so wisely. Other people don't have so much money.

Motor Order.—The Abitibi Pulp and Paper Co. has placed with the Canadian General Electric Co. an order for electric motors, ranging from 400 h.p. downwards, and aggregating 2,165 h.p. for their new mills at Iroquois Falls, Ont.

The Aluminium Castings Co., Ottawa, Ont., have installed 6 more furnaces, bringing the plant capacity up to 2,000 pounds per day. A 5-ton crane, supplied by the International Marine Signal Co., Ottawa, has been installed in the foundry.

New Hospital for Steel Company. — Excavations for the foundation of the new emergency hospital for the Dominion Iron & Steel Co., at Sydney, N.S., are under way, and the building will be rushed to completion before cold weather sets in.

The Toronto Electric Light Co. have recently purchased 2,200 h.p. of Riley Self-Dumping Underfeed Stokers, to be used in a stand-by steam station as a reserve for the power from Niagara Falls. The above type stoker was described and illustrated in the April, 1913 issue of our journal, The Power House.

F. Reddaway & Co., Newark, N.J., have appointed The A. R. Williams Machinery Co. to act as exclusive selling agents for the "Camel Hair" belting in Toronto and West to the Pacific Coast, also that complete stocks of "Camel Hair" belting are now being carried by the A. R. Williams Co. in Toronto, Winnipeg and Vancouver.

Morrisburg, Ont.—From the judgment of Hon. Mr. Justice Hodgins, Judge in Admiralty of the Exchequer Court, Toronto district, an appeal is to be made to the Supreme Court of Canada in connection with the barge Huron, which was wrecked here and its cargo destroyed in August of last year. Judge Hodgins gave judgment for $22,387 with costs in favor of the Montreal Transportation Co.

J. H. Williams & Co., Brooklyn, N.Y., advise us that they have not purchased a site or yet considered the establishment of a plant in St. Catharines, Ont. The item concerning the St. Catharines plant was evidently intended by our correspondent to refer to the branch factory being erected by the Williams Co., at Buffalo, N.Y.

C.N.R. Tunnel Electrification.—The Canadian Northern Railway Co. has just placed with the Canadian General Electric Co., Ltd., an order for the complete electrification of its tunnel under Mount Royal and of its terminals on Dorchester Street in Montreal. The contract, which amounts to about $500,000, includes seven locomotives, multiple unit cars, generators, switchboards and other auxilliary apparatus.

Boiler Inspection Certificates. — A number of boiler manufacturers, etc., attended the Parliament buildings last week with the hope of eliciting the opinion of the Ontario Government in regard to reciprocity of boiler inspection certificates between the various provinces. They declared that much needless trouble and expense is incurred under the present conditions, and that one provincial inspection should meet the demands of all concerned in the business. Other Provincial Governments will be approached in the near future.

Electric Pumping Plant.—The Canadian Collieries (Dunsmuir) have decided to instal an extensive electrically driven pumping plant. There will be four separate units. Two will be driven by 75 h.p. a.c. motors and a third by a 75 d.c. motor, each unit being capable of delivering 350 gallons per minute against a head of 370 feet. The fourth unit, consisting of two pumps working in series, will deliver 350 gallons per minute against a head of 740 feet. The pumps will be built by the Canadian Allis-Chalmers, Ltd., and the motors by Canadian General Electric Co.

High Factory Taxation.—After further consideration of the appeal of the Massey-Harris Co. against the city's assessment of $609,000 on the Company's factory site on King Street West, Toronto, the Court of Revision decided to make a reduction on the whole 26 acres of $18,525, making the total figure $590,475, which compares with an assessment of $300,000 two years ago. The reduction was made on parcels of land used by the Company for the purpose of storing lumber. Mr. P. H. Drayton, chairman of the court, intimated that he was in favor of lower assessments on factory sites in the city of Toronto. "I do not believe in taxing the manufacturers until they are compelled to move outside the city," he said.

Brantford, Ont.—That Brantford will be able to meet the competition of other Ontario cities in securing Canadian branches of United States factories is now assured. At a meeting held under the auspices of the Greater Brantford Association, which was attended by about sixty citizens, representing practically all branches entering into the building of factories, promises of co-operation and concessions were made by brick manufacturers, cement manufacturers, gravel and sand pit owners, the Brantford Roofing Co., architects and real estate owners in the city, tending to greatly reduce the cost of factory sites, and cutting off about 20 per cent. of the cost of building factories here. It was announced that the promise had been made of twenty acres free for factory sites, while other plots had been offered at 50 per cent. of their value or less.

The Bury Compressor Co., Erie, Pa., manufacturers of the Bury three-cylinder variable compressor, as well as compressors to meet all engineering requirements, and who are represented by the A. R. Williams Machinery Co., Toronto, Ont., are extending their main plant to accommodate increased business. Recent shipments to Canadian customers through the The A. R. Williams Co., include a three-cylinder variable volume compressor going into the mining district, consigned to the North American Smelting Co., Sydenham, Ont.; a duplex compound variable volume compressor to the Standard Steel Construction Co., Port Robinson, Ont.; a large compound air and steam machine to the Toronto Structural Steel Co., Toronto; and an 800 cubic ft. compressor for the Canadian Glass Co., Montreal, Que.

Water-Works

Galt, Ont.—The new dam of the Galt Gas & Light Co. across the Grand River was completed last week.

Montreal, P.Q.—Montreal's new $3,000,000 filtration plant is not large enough, and within twelve months at the latest another $1,000,000 or more will have to be spent on the work in order that it may meet the requirements of the city.

New Incorporations

Schroeder Mills and Timber Co., incorporated at Toronto, Ont., capital not to exceed $40,000, to manufacture timber, etc., in Ontario.

Dominion Reduction Co. Ltd., incorporated at Toronto, capital $2,000,000, to reduce ores, etc., at Cobalt. Incorporators: James G. Shaw, Joseph Montgomery, etc., Toronto.

Major Automobile, Ltd., incorporated at Ottawa, capital $50,000, to manufacture automobiles, etc., at Montreal. Incorporators, George A. Major, Alexis Frappier, etc., Montreal.

Automatic Fire Detectors, Ltd., incorporated at Toronto, capital $100,000 to manufacture fire extinguishers, etc., at Toronto. Incorporators: John F. Long, Frank P. Long, etc., Toronto.

Ogden Electrical Mfg. Co., Ltd., incorporated at Ottawa, capital $100,000 to manufacture electrical appliances and instruments at Toronto. Incorporators: James F. Edger, James E. Maybee, etc., Toronto.

Reid-Easey Co. Ltd., incorporated at Toronto, capital $40,000, to carry on the business of a general foundry and machine shop,etc., at Oshawa. Incorporators: George Proctor, Alfred Smith, etc., Beaverton.

St. Francois Co., Ltd., incorporated at Ottawa, capital $100,000, to carry on the business of a constructing and contracting company, at Montreal. Incorporators: Victor Pelletier, Jean de la Toure Fondue, etc., Montreal.

Central Contracting Co., Ltd., incorporated at Toronto, capital $50,000, to carry on the business of a sawmiller, etc., at Fort William. Incorporators: Edward R. Wayland, Charles E. Smith, etc., Fort William.

Ottawa Car Mfg. Co., incorporated at Ottawa, capital $3,000,000, to carry on business as manufacturers of steam and electric cars., etc., at Ottawa. Incorporators: James F. Smellie, Thomas A. Burgess, etc., Ottawa.

T. Heal Woodworking Co., Ltd., incorporated at Toronto, capital $40,000, to carry on the business generally of a contractor, carpenter, etc., at Toronto. Incorporators: William J. Mitchell, William S. Thomas, etc., Toronto.

Worr Foundry Co., Ltd., incorporated at Toronto, capital $40,000, to carry on in all their branches the business of iron founders, foundrymen and machinists. Incorporators: Ernest V. McMillan, James Aitchison, etc., Toronto.

Canadian Carter Co., Ltd., incorporated at Ottawa, capital $150,000, to build, construct, erect, equip, railways, tramways, roadways, tunnels harbors, slips, shipping places, at Ottawa. Incorporators: John B. Carter, Charles A. Deneen, etc., Ottawa.

Economy Fuse & Mfg. Co., of Canada, Ltd., incorporated at Ottawa, capital $5,000, to manufacture all kinds of mechanical and electrical appliances at Montreal. Incorporators, Richmond W. Hart, Armand Chenier, etc., Toronto.

Upper St. Lawrence Power Co., Ltd., incorporated at Ottawa, capital $3,000,000, to purchase, lease and operate water powers, etc., with headquarters at Toronto. Incorporators: James S. Lovell, William Bain, etc., of Toronto.

Maxwells, Ltd., incorporated at Ottawa, capital $400,000, to buy, sell, manufacture, in whole or part, farm implements, engines and machinery of all kinds, at St. Marys, Ont. Incorporators: Sir George Gibbons, George S. Gibbons, etc., London.

North American Development & Construction Co., Ltd., incorporated at Ottawa, capital $100,000, to carry on the business of hydraulic and electrical engineers at Winnipeg. Incorporators, Standish R. G. Vereker, Hamsterley, William J. W. Bullock, Winnipeg.

Cadillac Motors., incorporated at Ottawa, capital $50,000, to manufacture or otherwise deal in conveyances and machinery of all kinds, and all materials used in the construction or operation thereof, at Montreal. Incorporators: Francis G. Bush, Herbert Wm. Jackson, etc., Montreal.

The Inter-Provincial Engineering and Contracting Co., Ltd., incorporated at Toronto, capital, $75,000, to carry on the business of public and private contractors and manufacturers of building materials of all kinds, at Toronto: Incorporators: John T. Jackson, Samuel Jackson, etc., Toronto.

Personal

Senator Nathaniel Curry was inspecting the Canadian Car & Foundry Co. plant in Fort William on Monday, Sept. 29.

Hon. Nathaniel Curry, President of the Canadian Car and Foundry Co., was in Amherst, N.S., last week, inspecting the Rhodes-Curry Car Works.

K. L. Aitken, formerly general manager of the Toronto Hydro-electric System, has returned from Europe, and will resume his practice as consulting engineer. Letters may be addressed meantime, in care of the Toronto Hydro-electric System, 226 Yonge St., Toronto.

Catalogues

The American Wood-Working Machinery Co., Rochester, N.Y., have sent us a catalogue describing the full line of machines which they manufacture. Each machine is illustrated together with a specification, floor space required, weights, etc. A complete telegraph code is included, also an index. This is the 9th edition, and the illustrations are very clear, as is the reading matter. Copies may be had by writing Wm. Garlock, Jun., Peterkin Bldg., Toronto.

The Canadian Allis-Chalmers, Ltd., Toronto, have sent us section (A) of a bulletin on the "Cochrane" separators, which are made by the Harrison Safety Boiler Works, Philadelphia, Pa. The separators described in this bulletin are designed for live steam and for various pressures. Each type and size are illustrated together with tables giving the principal dimensions. The benefits to be derived from installing separators are dealt with fully. Copies may be had by writing this company.

Comparative Tests of Belts With and Without Cling-Surface is the title of a bulletin written by Robert Thurston Kent, M.E., and published by the Cling-Surface Company, Buffalo, N.Y. The bulletin contains a description of a series of tests on belts, with "Cling-Surface" applied, conducted by Mr. Kent. The tests were of an exhaustive nature and much interesting data was obtained. Several curves were plotted, these being published in the bulletin. Copies may be obtained from A. Eugene Michel, 233 Broadway, New York City.

Notes on Electric Lifts is the title of a handsome catalogue which we have received from Smith, Major & Stevens, Northampton, Eng. A detailed description with illustrations is given of the principal features embodied in the design of the elevators made by this firm, a special feature being made of the automatic control elevator. The catalogue also contains some excellent photographs of buildings where these elevators have been installed. Gorman, Clancy & Grindley, Ltd., Edmonton, Alta, the Canadian representatives, will be pleased to mail copies on request.

"The Lagonda Roller Bearing Cleaner" is the title of Bulletin X, recently issued by the Lagonda Mfg. Co., of Springfield, Ohio. It describes a new type of water driven boiler tube cleaner which they have just perfected and put on the market. In this new cleaner, the old type thrust bearings have been replaced by tapered roller bearings. It is pointed out in the bulletin that experience and long service have proven that bearings of this type are admirably adapted for use on automobiles, where the bearings are subjected to severe thrusts, and as these are the conditions encountered in turbine tube cleaners the adoption of this bearing has resulted in a marked increase in efficiency and power output of the new type of cleaner. Copies of the bulletin may be had by addressing the company as above.

"The Lagonda Air Cleaner," is the title of Bulletin Y, recently issued by the Lagonda Mfg. Co., of Springfield, Ohio. It describes a new type of air driven boiler tube cleaner which has several novel features. One is the use of an adjustable air admission port in the corner, by means of which the size of the air opening can be adjusted to exactly meet the air pressure conditions in any given plant, thus insuring that the cleaner develops the maximum amount of power for the quantity of air consumed under all conditions. The method of dismantling the cleaner is extremely novel. It is only necessary to loosen a hexagonal retaining ring at the front which renders all of the interior parts of the cleaner readily accessible without the use of tools. Copies of this bulletin may be had by addressing the Lagonda Mfg. Co. as above .

Everything in Sheet Metal.—A catalogue has recently come to our attention which embraces a more than usually complete line of sheet metal products. Every conceivable need of the varied types of building construction appears to be anticipated, and every imaginable building material is illustrated and thoroughly described, including roofing, siding, eaves trough, conductor pipe, gutters, ventilators, skylights, metal ceilings, metal furniture, metal lumber, metal stock room equipment, cornice, finials, reinforcing and furring plates, metal lath, metal shingles, tin plate, metal tile, etc. Everything is classified in so thorough a manner that it is immediately located, and many tables are given which will prove especially valuable to the sheet metal worker or to the prospective buyer of these materials. The Berger Mfg. Co. of Canton, Ohio, is the publisher of this book, and their line needs no introduction to the building fraternity. A copy of this book will be gladly sent to any of our readers interested.

J. A. Fortier & Co., Ottawa, Ont., have been appointed agents for the Arctic Ice Machine Co., Canton, O. Messrs. Fortier are experts in refrigeration. This appointment has been made necessary owing to the exceptional number of inquiries received by The Arctic Ice Machine Co., from Canada of late.

Book Reviews

The Department of the Interior, Bureau of Mines branch, of the U. S. Government has published Technical paper No. 43, entitled "The influence of inert gases on inflammable gaseous mixtures." This bulletin contains the results of experiments, conducted by J. K. Clement on various gases present in coal mines.

The Department of the Interior, Bureau of Mness branch, of the U.S. Government has published bulletin No. 64, dealing with the titaniferous iron ores in the United States. This bulletin contains the results of investigations conducted by J. T. Lingewald, Jun., on the above subject together with a number of illustrations of different varieties of iron ore.

The City of Port Arthur, Ont., have issued two bulletins, one entitled the "Geneva of Canada," and the other "Camera Glimpses of Port Arthur." The former contains several half tones of scenery and pleasure resorts in the vicinity of the city, also views of the principal buildings and docks. The principal features of the city are described fully, with useful information for visitors. "The Camera Glimpses" contains a number of views along the same lines, together with brief descriptions.

"Principles of Setting Out, Securing, and Tooling Operations," by Alfred Parr, instructor and lecturer on engineering workshop practice, University College, Nottingham, England; Longman and Co., London, New York, etc.; The Renouf Publishing Co., Montreal, publishers' agents for Canada. Price \$2.25. A number of years ago we had the pleasure of reading a volume entitled "Machine Tools and Workshop Practice" by the same author, which came at a time when radical changes were being evolved in machine tools. This new treatise on "Principles of Setting Out," is even a better work than its predecessor. Some of the ground covered by the latter is covered again, but there is so much new matter on the subject of setting-out, and on new tools which have appeared since the author's last work was written, this can be excused.

Engineering as a Profession, by A. P. M. Fleming, M.I.E.E., and R. W. Bailey, Wh. Sc., cloth, 288 pages. Published by John Long, Ltd., London, Eng. Price 60 cents. (2s. 6d.) net. This book is written for the guidance of those seeking to enter or those who are already engaged in the engineering profession. It describes methods of training, and where the training may be obtained, also the possible cost, so that various grades of apprentices will be guided as to which course will be most suitable for them. It defines the scope of engineering in all its branches, comparing it with other professions and indicates qualifications necessary for a successful career. A difficult and complex subject has been handled clearly and intelligently, and a great deal of useful information concerning schools, colleges, and engineering works has been gathered together so that the reader should be able to come to a decision without much difficulty. The book deals entirely with conditions prevailing and with colleges and engineering establishments located within the British Isles. It is, therefore, apparent that it will be read with greater interest by those residing there. The principles involved, however, are well worth studying and can be applied to conditions prevailing in Canada as there is the same need here for a definite system of training apprentices and engineers as in the Old Country. By the process of substitution, the courses outlined in the book could be carried out in Canada. The book is printed in clear type, and the price is within reach of all.

MACHINE TOOL BUILDERS' CONVENTION.

THE Twelfth Annual Convention of the National Machine Tool Builders' Association will be held at the Hotel Astor, New York, Wednesday, Thursday and Friday, October 22, 23 and 24. At the first session Wednesday morning there will be announcement of Convention Committees, call for resolutions, reports of officers and committees, and an address by Clinton H. Scovell, of the Clinton H. Scovell Co., Boston, on "Cost Accounting Practice, with Special Reference to Machine Hour Rate." The programmes for the second session to be held Wednesday afternoon and

Plant of Moffat-Irving Electric Smelters, Ltd., Toronto

Staff Article

The electric furnace is rapidly passing from the experimental stage to a commercial basis; the following description of a new type of furnace and process introduced into Canada should therefore be of interest to our readers generally, but perhaps more particularly to those engaged in the manufacture and utilization of steel castings, as there is evidence of a radical change imminent in this sphere, due to electricity becoming available at a favorable rate, on account of our large water power resources.

THE smelting of iron ore by electrical means is a process that has been closely investigated by many metallurgists in recent years. Electric furnaces of varied types are now being operated on a successful commercial basis in Europe and the United States, but in Canada, apart from experiments conducted by the Government, little has so far been done. Castings of high tensile strength, clean, free from blow holes, and of high grade quality are, we understand, being turned out at the Moffat & Irving plant here described.

Mr. James W. Moffat has been making investigations for a number of years, and after much experimenting has finally evolved the process and designed the furnace which is the subject of this article. Mr. Moffat is associated with Mr. T. C. Irving, jun., who is a prominent steel plant engineer, and together they form the company called the Moffat-Irving Electric Smelters, Ltd., Toronto.

Electric Smelting Process.

The need of a process to smelt finely pulverized ores has been greatly felt. Our Canadian iron ores in particular required concentration to free them of impurities. Large bodies of magnetic iron sands exist on the shores of Lake Superior and the St. Lawrence River and Gulf, and a process was wanted that would permit these to be smelted as fines, and without the added cost of briquetting, nodulizing or sintering. Other fines were also available in the shape of flue dust from the blast furnaces and the mill scale from rolling mills. To smelt these fines alone without any danger from explosions, to utilize the calorific power of the furnace gases as much as possible, and to avoid the cost of briquetting, nodulizing or sintering them, led to the design of the furnace here described.

In the blast furnaces the reducing gases generated at the tuyeres find their way upwards through the voids in the descending charge of lump ore, lump limestone and lump coke, and effect the reduction of the ore in their passage through. Ore, when in the shape of fines, will fill up these voids and prevent the even working of the furnace, so only a limited amount of them can be used with safety. Sometimes when the downcoming charge reaches the zone where the temperature renders them pasty, the fines will close

ELECTRIC FURNACE INSTALLATION. MOFFAT-IRVING ELECTRIC SMELTERS, LTD., TORONTO.

up the voids entirely and prevent temporarily the upward passage of the gases, and as the gas is still being formed around the tuyeres, the pressure increases until the charge slips with explosive force, or the top of the furnace is blown off.

The idea occurred to those working on it that a furnace could be designed to handle fines only and safely by reversing the conditions in the blast furnace; that instead of the reducing gases being made to find their way through the voids in the charge, the charge in the finely crushed state could be successfully showered in an uninterrupted stream through a body of reducing gas, and that it was all the more possible with an electric furnace which required no air blast in its operation. After considerable experimental work, a furnace was designed and erected by the Moffat-Irving Electric Smelters, Ltd., at their works on Front Street East, Toronto, using 300 k.w. and having a capacity of 3,000 pounds of metal in its crucible. It has many advantages, such as:

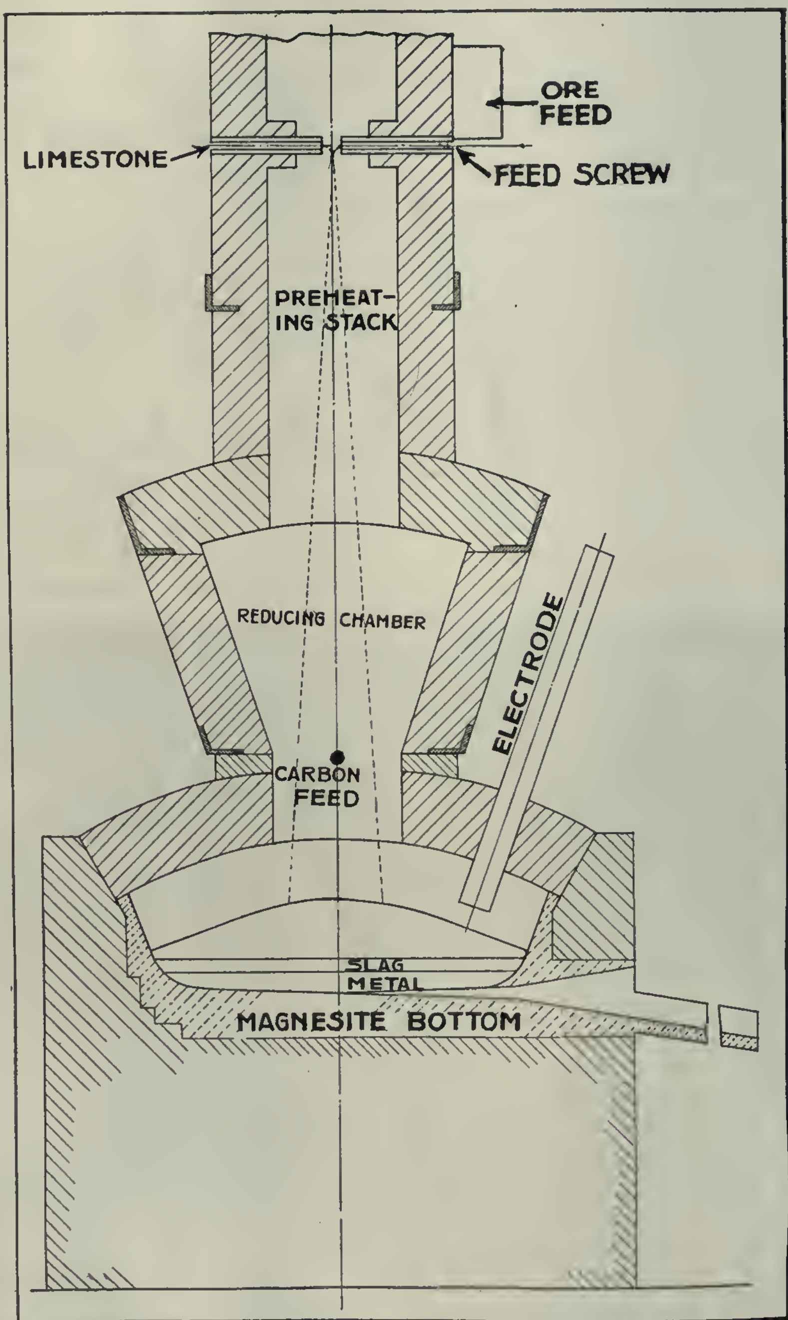


DIAGRAM OF FURNACE, MOFFAT-IRVING ELECTRIC SMELTERS, LTD., TORONTO.

Advantages.

The concentration of the ores to a high metallic content reduces the amount of flux required and the loss of heat wasted in melting the slag making materials; it is cheaper to take the impurities out of the ore by some concentration process costing a few cents per ton of crude ore than to take it out as slag with electric heat at a cost of many dollars; scaffolding and slips in the furnace do not occur; the feed of the charge of fines can be easily regulated, and the carbon can be introduced into the furnace at a point close above the bath, where none of it will be burned to carbon-dioxide, as happens with the blast furnace; the cheaper forms of carbon only are required, such as coke breeze, slack coal or charcoal dust; the ore, flux, and carbon are charged separately, and this enables their ratio to each other to be varied instantaneously, and the change immediately affects the molten bath in the crucible. There being no column of descending charge, the crucible may be of the tilting type, and the furnace may be operated continuously or intermittently for the same reason.

Operation Features.

The furnace can be operated on ore only, on any pig and ore process, or on scrap metallic fines and pig iron. The refining of the molten metal is carried on just as in the open hearth furnace of to-day, the only difference being that the heat required to do the work is supplied by electricity instead of gas. A basic bottom of magnesite, brought from Austria, is used.

Finished Steel Analysis.

Recently the Company has been working it with charges of metallic fines and scrap metal. Their finished steel has the following analysis:—

Carbon—0.25 to 0.35 or 0.40 of 1%
Silicon—0.27 to 0.30 of 1%
Manganese—0.65 to 0.70 of 1%
Sulphur—0.02 to 0.04 of 1%
Phosphorus—0.02 to 0.04 of 1%

The ultimate tensile strength of this metal is between 75,000 and 90,000 lbs. per square inch. In quality it is equal to crucible steel or even better. Compared with open hearth steel, that made in any of the electric furnaces is better, and this is due to the different conditions existing in the two furnaces. In the electric furnace the molten metal is lying under an atmosphere far more deoxidizing than can be found in any open hearth, and it can be held there longer with safety to allow suspended matter to separate and come to the surface. The electric furnace steel is much freer from carbonic-oxide, which is the cause of the blow holes so frequently found in steel.

The furnace is also practically air tight, so no hydrogen and nitrogen can enter the metal, two elements that are carried in with the gas used in the open hearth process, and are actually blown through the molten metal with the air blast in the case of the converter process. Both of these elements have long been considered deleterious to the quality of steel.

Patent Rights.

Very basic patents have been issued to the Company on the process in Canada, United States, Mexico, Brazil, Great Britain, Norway, France and other countries. It is their intention to erect a larger plant as soon as a suitable location can be secured in Toronto or elsewhere, and to instal larger furnaces, each using about 1,000 k.w. of electricity. Such a plant, it is stated, would employ at least 500 men. They have already made many steel castings for large firms in the iron and machinery trades, and as a sample of the working efficiency of their steel, they quote the case of the Consumers Gas Co., Toronto.

The pusher heads of the machine charging their retorts have in the past been made of the best steel forgings procurable. The life of these has been from four to eight days continuous service of 24 hours. They are operated under extremely severe conditions, the temperatures of the retorts in which they enter and push a load of about a ton every five minutes of the 24 hours being kept at about 1,800 degs. Fahrenheit. To keep the pusher heads somewhat cool, cold water is thrown on them as they are withdrawn, a service every user of steel will at once recognize as being about as severe as any known. The castings supplied by this company for the work are having a life of from eight to ten weeks.

Electric Furnace Feature.

The diagram shows the general outline of the furnace without the steel framing. The raw materials, ore and limestone, are carried to the charging floor above the feed boxes by a bucket conveyor, each class of material being stored in separate boxes or hoppers above the screw feed conveyors which are mechanically operated, and which feed the materials into the furnace. These materials have previously been pulverized to a finely divided state, and after being fed into the furnace, fall down in the form of a shower, as indicated by the dotted lines in the diagram. Below the reducing chamber, carbon in the form of pulverized coke, is fed into the furnace in a manner similar to the other materials. Air is introduced at the top of the reducing chamber to burn the escaping carbon-monoxide in the waste gases to carbon-dioxide, and so add to the heat in the reduction chamber. The slag is drawn off through a door at the back; scrap can also be fed through this door when desirable.

There are three electrodes made of graphite, and using three-phase current at about 65 volts. The electrodes are operated from a control station nearby, and can be raised or lowered by the operator, when necessary, to equalize the amount of current being used by each. This is indicated by three ammeters situated in front of the operator. In the transformer house is a Packard oil insulated water-cooled transformer, receiving current at 12,200 volts and transforming it down to 65 volts. The chambers through which the electrodes enter the furnace have water jackets, so have the clamps holding the electrodes, and also the bottom charging door, through which the slag is withdrawn. When the furnace has been warmed up, a heat can be drawn in a comparatively short time, the heat being so intense, and practically only limited by the ability of the firebricks to stand up to it without melting.


PLANT EXTERIOR, MOFFAT-IRVING ELECTRIC SMELTERS, LTD., TORONTO.

A feature about the construction of the furnace is the way in which the various sections are supported, independently, by the framework. The steel frame carries each section, so that if, say, the brickwork forming the reducing chamber required renewing, the stack would remain intact; also if the roof of the furnace required repairing, this could be done without affecting the reducing chamber above. The angle castings shown in the diagram are connected to the frame, and support their respective sections.

At the present time flue dust obtained from blast furnaces is being used in preference to lump ore, as it is in a finely divided state and can be readily concentrated to contain a high percentage of iron, thus making it a very suitable material for using in electric furnaces.

Foundry Features.

The building in which the furnace is situated lies at the eastern section of the property, and is 74 x 34 feet. That portion of the floor not occupied by the furnace and its auxiliaries is used as a foundry, the moulds being brought from the moulding shop ready for pouring. The building is equipped with an overhead runway, which carries a 2-ton Simplex chain block. Tracks run along each side of the building. There is an oil burner for heating the ladles, the oil being delivered by a rotary pump from a tank of 625 gallons' capacity, located outside the building. The air is supplied by a Garden City rotary blower. A 10 h.p. Can. General Electric motor drives the blower, oil pump, conveyor, grinders, etc. There is a blacksmith's forge in this building. There are three 1½ ton ladles, bottom pouring type, supplied by the E. J. Woodison Co., Toronto, and made by Byram & Co., Detroit, Mich.

Moulding Shop.

The moulding shop has a floor space 100 x 42 ft., and contains, besides the requisite number of flasks, a sand grinding mill, a 2-ton air hoist carried by an overhead runway, and a drying oven, heated by a coke fire. Tracks are laid throughout the building. In one section is a balcony carrying a pulverizer supplied by the Jeffery Mfg. Co., Montreal, and a magnetic separator supplied by Ball & Norton, Troy, N.Y. As already stated, the materials used in the furnace have to be of fine proportions, and for this reason are passed through the pulverizer.

A conveyor carries the materials from the floor to the pulverizer, where they are reduced to the desired degree of fineness. The magnetic separator is used for extracting the magnetic iron from the flue dust, already referred to. The dust is carried on a rubber endless belt under a series of magnets, under which also is carried a rubber endless belt. The magnets extract the iron ore, which is deposited into a hopper, while the residue is carried away. This plant is operated by a 15 h.p. Can. General Electric motor.

Air Compressor.

Adjoining the moulding shop is a building, 84 x 18 ft., which is sub-divided into offices, cleaning shop and compressor room. In the latter is a "Sentinel" air compressor, supplied by Alley & MacLellan, Glasgow, Scotland, and driven by a 50 h.p. Can. General Electric A.C. motor at 550 volts. The compressor has a capacity of 300 cubic feet of free air per minute, and supplies air for various purposes, such as hoists, moulding machines, sand blast, etc. In the same shop is a Robertson No. 5 power hack saw machine supplied by Canadian Fairbanks-Morse Co., Toronto, and driven by a 2 h.p. Packard motor. The cleaning room, adjoining, contains a swing grinder and a No. 6 stand grinder, both supplied by the Gray Mfg. & Machine Co., Toronto, chipping tools, and rumbler. An oxy-acetylene welding plant, supplied by Kauert & Doehler Co., Montreal, and equipped with Masser torches, forms a further interesting unit of the general installation. There is also a sand blast outfit in connection with this department.

FIRE BRICK IN CUPOLA PRACTICE.*

By E. J. Woodison.**

THE subject of fire brick in cupola practice is a big one, because it must be viewed from many angles, and in this paper I am going to confine myself to cupola practice only, passing by malleable, steel and other furnaces used in the melting of iron, all of which present interesting problems.

First of all, let us consider what we have to contend with in the cupola. The answer, I think you will agree with me, is sudden heating and sudden cooling, each of which mean quick expansion and quick contraction respectively. It must of necessity be a very refractory material that can range from a temperature of. say, 70 to 2,370 degrees (the necessary heat from melting iron to a white color) in as short a time as 30 minutes, and then drop back to normal in a few hours.

There is an erroneous idea that friction does more harm than heat; this is wrong, as is evident by the blast furnace. A blast furnace makes, say, 100 tons of iron per day, and to accomplish this they must smelt 350 tons of iron ore together with the necessary amount of coke and limestone. Now, the blast furnace runs continually for two, three or four years without stopping, and the lining lasts until it goes out of blast; in other words, shuts down. It would, therefore, seem that friction has little to do with the life of a cupola lining. My contention is that the continual expansion and contraction disintegrates the lining, with the result that it melts down, or, when the bond is destroyed, spalls off.

During an experience of twenty-five years in the fire brick business I have found that brick adaptable for oil furnaces under pressure, malleable iron in the cupola does not work as satisfactorily as brick made, especially for cupola practice; yet more money frequently is paid for higher grades of brick. I say higher grades, because it is conceded they are higher grade for some purposes, although not so for the cupola.

Cupola Blocks and Bricks.

Cupola blocks and brick have to be very carefully handled in their manufacture to prove satisfactory in your practice. I have frequently seen good cupola blocks spoiled because they were hastily dried, instead of being allowed to remain on the drying floor until the moisture was well dried out of the same before placing in the kiln. Again, I have seen cupola blocks taken out of the kiln before they were properly burned, with the result that those blocks would quickly spall off. All moisture should be thoroughly burned out; no green centre, otherwise they will not stand expansion and contraction.

I recall, some years ago, getting a new fire brick manufacturer to make cupola blocks for me. I told him how I wanted the mixture treated and cured. While at the works for a couple of days looking around, I found that they were not carrying out my ideas at all, that they were only allowing them to remain on the drying floor a short time, and owing to having considerable work on hand, were taking them out of the kiln before they were properly burned. Shortly after I got quite a number of complaints from people who had purchased the material, and naturally understood why such was the case.

It is surprising how little a great many fire brick manufacturers know of what is needed for cupola practice. Some of them figure that if they make proper sizes and of proper radius that nothing more is required. As regards actual cupola practice, their knowledge is very limited; yet as each of you know from your foundry experience, it takes a brick of exceptional ability to act serviceably in a cupola lining. In my experience I have found that it was not necessary alone to educate the manufacturer into the actual component parts necessary, the method and length of time required in drying, but in the method of placing in the kiln and burning.

One manufacturer who made cupola blocks for us placed them over the fire arches. The result was, they were burned so hard that they would not expand and contract. Still, another placed the cupola blocks in the top part of the kiln where they did not get fired enough, and were soft, which meant that they were only skin burned. When they were placed in the cupola after the heat had bungs and such like work, when placed penetrated the surface, they spalled off.

Slag should be kept in a fluid condition by the use of limestone, oyster or clam shells or by fluor spar. A much better drop will be had, less chipping will be necessary, which in turn means less labor in building up your bosh. Right here it might be well to admonish. Don't build up your lining with clay if the hole is large enough to put in a piece of brick. Place the clay or daubing on thin, and, if possible, gradually build the lining up to normal. Using clay or daubing one inch thick is a poor method, for as it dries it contracts; cracks appear, and it spalls off.

In the selection of a proper refractory it would seem that the point to consider is securing a brick which will stand expansion and contraction and eliminate the question of friction. See that your cupola tender lays the brick right, and, instead of plastering them in the cupola, have him dip in clay mixture made to the consistency of molasses. Keep your brick in a dry place. Some foundrymen leave them out in the weather. They go to pieces shortly after being placed in the cupola as a result, and the brick is consequently condemned, because its efficiency was destroyed before it got in the cupola. If perchance they did get wet, and you use them, be sure to keep a good fire in the cupola for eight or ten hours to dry out the moisture.

*Read at meeting of the Central Railway and Engineering Club of Canada, September 22nd, 1913.

**The E. J. Woodison Co., Toronto.

MIXTURES FOR REFRACTORY CASTINGS.

ESPECIALLY suitable for refractory castings, says "Giesserei-Zeitung," is a special mixing iron with low-silicon content, about 0.5 to 1 per cent., and moderate manganese content, about 1.5 per cent. Manifestly, the phosphorous content also must be kept as low as possible. As another ingredient for refractory castings, may be considered cast steel or wrought iron, steel briquettes being especially appropriate.

Refractory cast iron itself should have about the following composition:

Silicon	1.4 to 1.5	per cent.
Manganese	0.6 to 0.8	per cent.
Phosphorus	0.3 to 0.4	per cent.
Sulphur	0.06 to 0.07	per cent.

The following are two mixtures for castings with quite thick walls:

Hematite, 35 per cent. Mixing iron, 25 per cent. (Silicon, 0.5 to 1 per cent.) Good scrap, 20 per cent. Steel, 20 per cent.

Hematite, 25 per cent. Low-carbon iron, 25 per cent. Good scrap, 25 per cent. Steel, 25 per cent.

Selecting the Proper Wheel for Grinding Castings*

By G. T. Estabrook

The development and application of grinding equipments in the preparation and production of machinery details and accessories are among the prominent features to be noted in modern engineering workshops embracing a wide range of specialties. Articles dealing with the different phases of the subject are, therefore, generally eagerly perused for their instructive value.

WHILE the choosing of the proper wheel for rough grinding castings of various metals is a comparatively easy proposition, at the same time it is a subject worthy of some consideration. As in fine grinding, a study of the conditions encountered in the different shops and foundries is of great assistance in determining the proper wheel to choose. The first thing to do is to ascertain everything possible pertaining to the particular class of work in hand. This information is apt to be taken in a broad sense; for instance, it may be gray-iron castings which are to be ground, and this only considered when choosing the wheel.

Metal of Castings Classification.

It pays to draw the line finer and ascertain what the grade of iron may be. We all know that stove castings are made of a mix to produce a fine-grained, soft and even iron. This also applies in many cases to high-grade machinery castings. It is in the so-called job foundry that the metal will show a greater variation and, as a rule, run coarser and harder. Other conditions being equal, a harder grade wheel can be used for grinding fine soft iron than is used for the harder, coarser metal, and still cut as freely.

In both large and small foundries the superintendents or foremen are so familiar with the conditions themselves that in ordering a wheel they sometimes take it for granted that the wheel manufacturer will also know what is required without having these details. This is a mistake which is often committed unknowingly, and its elimination will go a long way towards getting the right wheel in the right place.

If this close classification of metal is required of gray iron, it certainly is of malleable iron. It would almost seem that no two foundries make a malleable iron even nearly alike, and any superintendent will admit that this kind of metal will vary in hardness from time to time, even if the mixture is identical in every case. This applies to furnace rather than to cupola malleable iron. The proper w y to grind the latter is before it is annealed, and it requires a wheel but little different than one used for grinding gray-iron castings. On brass and composition castings, such close classification is not necessary, as the same wheel will take care of all kinds of mixtures except straight aluminum or copper.

The Speed Question.

The speed question, of course, is of some importance, and must be taken into consideration. A surface speed in excess of 5,000 feet for rough grinding is unnecessary, although some manufacturers run their wheels at a speed much greater than recommended, and claim better results. It would appear better to use a harder grade of wheel in conjunction with a lower speed, thus using less power, causing less wear and tear on bearings,, etc., and without the element of danger or loss of wheel in case of breakage.

In cases where the wheel speed is too slow, better results will be obtained on gray iron by using a slightly finer or harder wheel, the extent of the change made depending on the speed variation, between 5,000 surface feet and the speed at which the wheel spindle actually runs. There is a dragging action which wears away the wheel when a hard, brittle material is being ground under a slow wheel speed condition.

In grading cup or cylinder wheels, when they are to be used for rough work and hand grinding, no trouble will be experienced with wheels of the same grit and grade as furnished in a solid wheel, providing the same allowances for speed conditions are made. The fact that much side grinding is done on solid wheels, and satisfactorily as far as grit and grade are concerned, is proof of this contention.

Snagging.

The proper grit of a snagging wheel depends, of course, upon the finish desired, although in some cases this is of little importance. It depends also upon the size of the work, which in many cases, if not always, governs the amount of stock to be removed. The size of the wheels are also to be considered, principally the width. In many cases, wheels are used, which are too wide for the work and vice versa. On large and heavy work a wheel of large diameter is economical, but on light work which requires little grinding, there is a question if, in the long run, it would prove so, due to its liability to cause trouble by running out of true. The proper sizes, therefore, also the grits and grades can many times be accurately determined by noting the size of the work and also the operation of grinding it.

Hard and Soft Spots.

Many time, complaints of hard and soft spots are due to the grading, condition of grinder, speed, size of wheel and work, and method of grinding. If a wheel runs out, it is in the majority of cases at once blamed to the wheel, and hard or soft spots cause the trouble—in the estimation of the user. It is impossible to obtain good results when the grinding machine is out of repair, not to mention the element of danger.

Naturally the thing to do is to improve conditions where required, but in some cases the customer insists that the wheels are faulty because they used to run all right. He refuses to understand wherein the trouble lies and that the grinder has changed, and not the wheels. While such cases are fortunately few, conditions can be directly improved, but not without losing in another direction what may be gained by a change of wheel grade. Even then it is almost impossible to know what change to make, as even on such work as may be termed rough, there is the element of human nature to contend with.

Complaints of soft spots may be overcome by using a softer grade of wheel, as it will wear down even and run smoothly. There is no jump as from the harder grade, caused by the latter getting out of true. Theoretically, complaints of wheels getting out of true would be more liable to come from shops where they are used on flexible shafts and compressed-air-driven portable grinders; also, when wheels are run on swing frame grinders, or when heavy work is suspended and forced against a wheel on a stationary grinder. In the last two cases, however, the vibration or chatter of the wheel against the work is greatly lessened, and in many cases entirely overcome, by the weight of the wheel and head in the first case, and the weight of the casting in the second. What change to make to overcome such a complaint depends largely upon the existing local conditions.

Provided the wheel is correctly graded for the work, under ordinary conditions, a wheel of harder grade can be substituted, as it will stay round longer, but is more difficult to true off. On the other hand, a softer wheel will be-

*In the "Abrasive Age."

gin to run quicker, but being softer it will round itself true again almost before its being out of balance is perceptible.

While I have never seen a comparative test made, I believe the softer wheel would prove more economical, when the loss of the hard wheel from dressing is considered, together with loss of time in performing this dressing operation.

Wheel Breakage.

At various times, we hear of wheels breaking, and usually the wheel has to take the blame, whereas, in my opinion, in the vast majority of cases, the breakage is caused by carelessness or ignorance. Naturally, the first thing thought of is the speed, but this is only one of many causes. The crowding of the wheel on the spindle, rather than taking the equivalent length of time to scrape the hole, if this proves necessary to obtain an easy fit, is another common cause of breakage Exerting too much pressure in tightening the nut, causing a tremendous strain against the sides of wheel, especially if flanges are not relieved as they should be in every case, is another common cause. Care should always be taken to keep the work rest, if one is used, close enough to wheel so as to overcome the danger of the work getting caught. It is usually taken for granted that the bearings of machines are kept babbitted and the machines kept in good condition generally.

AN INTERESTING BOILER REPAIR.

THE twin-screw steamship "Canada," 11,440 tons, of the Austro-American line, is one of the largest vessels entering Montreal harbor during the present season. She is, moreover, one of the largest emigrant ships in the world, having accommodation for over 3,000 steerage passengers, together with a crew of 160.

The "Canada" is propelled by quadruple expansion engines fitted with Walschaert valve gear, and steam at 215 lbs. pressure is raised in four boilers of the Scotch type. Each of the latter has three furnaces, the two centre boilers being single-ended, while the port and starboard boilers are double-ended. On the ship's first voyage to Montreal from Trieste this season, she met with a mishap, which put the port boiler out of commission. She had a very light cargo on that trip, and was only drawing 13 feet forward and 21 feet aft, as against her normal draft of 30 feet when fully loaded.

The incident took place in the afternoon when off the Banks of Newfoundland. The "Canada" had on board 2,300 passengers, the majority of whom were on deck at the time. A strong north-easterly wind sprang up suddenly, and as there were numerous icebergs in the vicinity, this wind was very cold, causing the passengers to make a concerted rush to the lee side of the deck houses. This movement, combined with the strong wind, gave the vessel a bad list to port, with the result that the crown sheet of the starboard combustion chamber of the port boiler became overheated and collapsed.

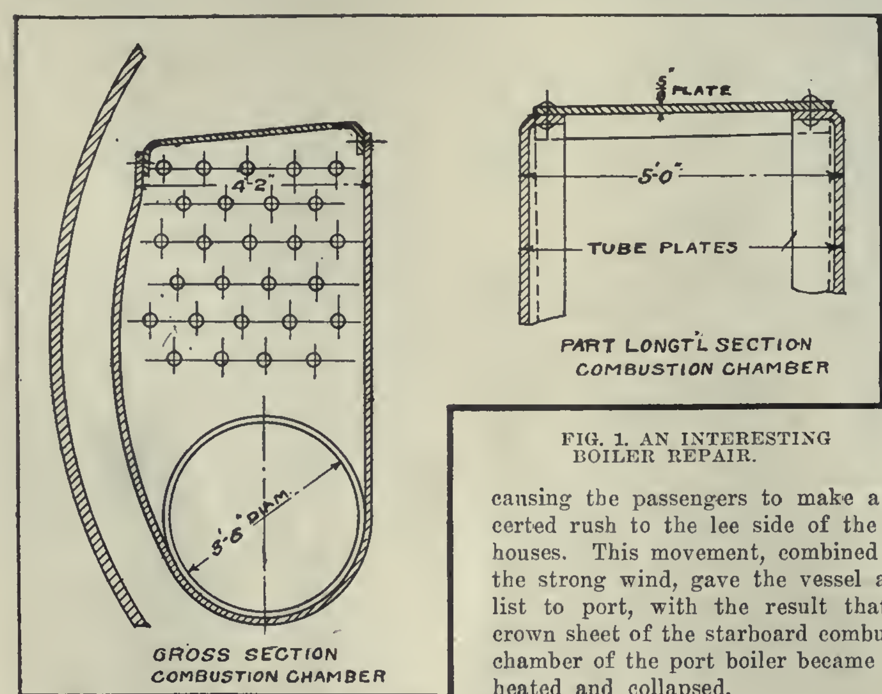


FIG. 1. AN INTERESTING BOILER REPAIR.

There were three inches of water in the glass at the time, and directly the ship listed extra feed was given to all the boilers. At the same time the starboard tanks were filled as rapidly as possible in an endeavor to bring the ship again upon an even keel. These measures took about ten minutes, by which time the crown sheet of the combustion chamber in question had been badly burned. It collapsed in pockets between the staybolts, causing the holes for the latter to become enlarged, although the bolts did not actually pull out. There was, however, a serious leakage of steam and water into the furnaces.

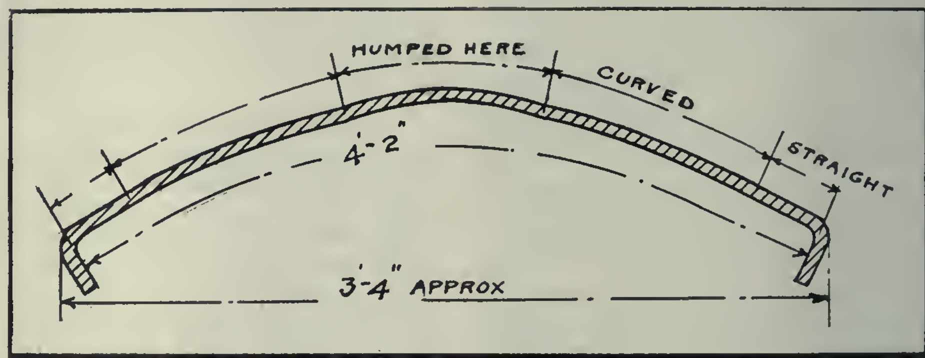


FIG. 2. AN INTERESTING BOILER REPAIR.

The ashpan and uptake dampers were immediately closed, and the fires drawn. The latter operation proved rather a difficult one owing to the escaping steam; but fortunately no one received injury.

Making the Repair.

The voyage was continued with three boilers, and on Montreal being reached, repairs to the damaged combustion chamber were at once undertaken by the Hall Engineering Works of that city.

The combustion chamber top was 4 feet 2 inches wide by 5 feet long, and it was desired to have the new crown sheet made from a single plate, but the internal diameter of the corrugated furnaces was only 3 feet 6 inches; so that at first sight there s emed to be no choice but to use two plates and have a riveted joint along the top of the chamber. Such a joint would, of course have been highly undesirable in such a location, and the manner in which the necessity for it was overcome is shown in the accompanying cuts.

The crown sheet, it should be mentioned, was $\frac{5}{8}$ inch thick and of ordinary boiler plate quality—60,000 pounds tensile strength. It was flanged on two edges to make joint with the combustion chamber side sheets, as indicated in Fig. 1. In order to get it through the flue it was determined to roll it to a curve, as shown by Fig. 2. A piece of $\frac{1}{8}$ inch plate was first taken and cut to the dimensions of the crown sheet. This plate was then flanged, so that it formed a true templet of the heavier plate. It was then put through a set of rolls and various trial curves given to it until it would pass easily through the flue. The curve did not extend the full width of the plate, a portion of the latter being left flat near each of the two flanges. A rather sharper radius was given along the longitudinal centre line than elsewhere, the general shape of the curve being shown in Fig. 2.

The templet having been satisfactorily shaped, the crown sheet was rolled to the same curvature. It was then transported from the Hall Engineering Works to the ship, where it easily passed through the furnace flue into the combustion chamber.

The next step was to raise the plate and place it upon the top of the forward tube sheet with the flanged edges in a fore and aft direction—that is, in a position at right angles to the direction they were to eventually occupy. This is shown in Fig. 3.

Straightening the Plate.

The plate having been got into the position indicated, stout timber struts were fitted between it and the boiler shell. These served to hold it securely while one half was gradually straightened out by hydraulic jacks. When this had been satisfactorily accomplished the plate was removed to a similar position on top of the other tube sheet, and the straightening operation repeated on the other half. The plate was practically straightened cold, it only having had "the chill taken off," in order to avoid the risk of setting up serious stresses in the metal.

All that now remained to do was to turn the plate round into its final position and drill it for the rivet and stay bolt holes. The rivets were then driven, the girder stays replaced, and, in just a week's time from the commencement of the job, the boiler was ready for steam again. Of course, work was carried on night and day; but, even so, the performance was a good one. Turning the plate around and afterwards straightening it were two very awkward operations in the cramped quarters afforded by the combustion chamber; and that the work was satisfactorily accomplished speaks well for the facilities to be found at the port of Montreal, and the resourcefulness displayed by and emergency equipment available at the Hall Engineering Works there.

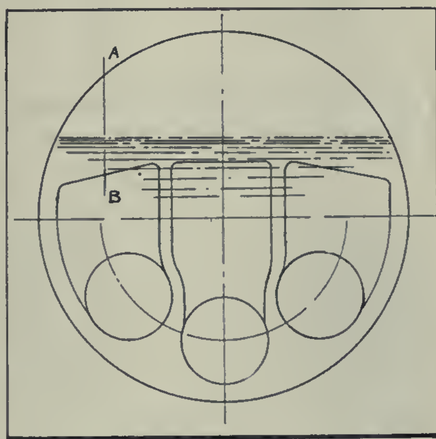


FIG. 4. AN INTERESTING BOILER REPAIR.

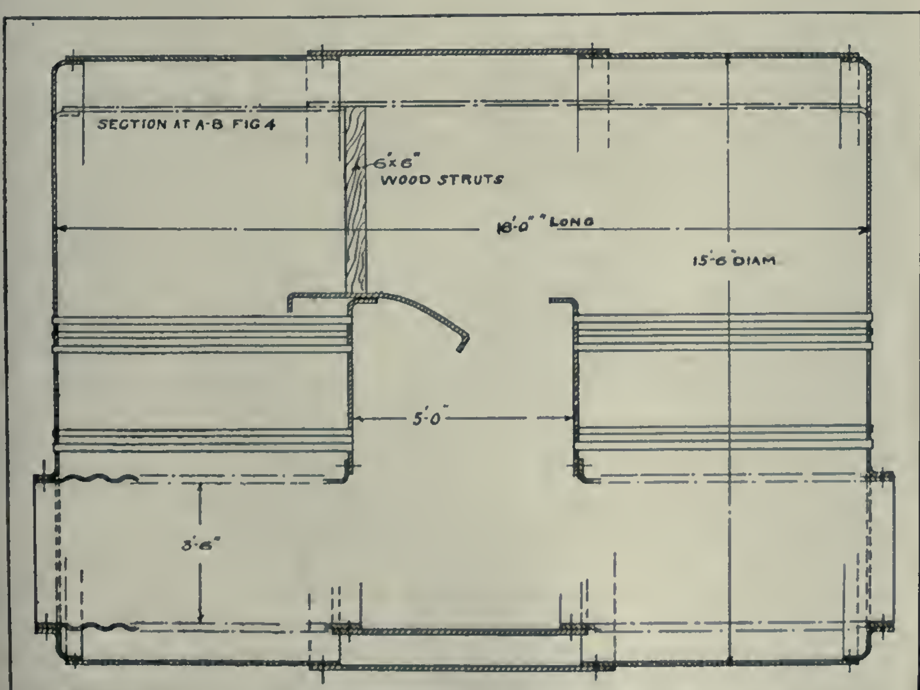


FIG. 3. AN INTERESTING BOILER REPAIR.

HOW AND WHY IN THE MACHINE SHOP.

During my visits to engineering firms, says "Kontor" in Page's Weekly, I have been forcibly struck with the enormous quantity of machines to be seen in works engaged in the mass manufacture of specialities, which have been produced in their own works. Upon demanding the reason for such procedure, the information has been tendered that the usual commercial machines had been found either entirely unsuitable or lacking in quality, power, or stability. In few instances was price the determining factor, for it was realized in the majority of cases that home-made machines made in small quantities must necessarily cost more than standard productions bought from specialists. It is true that at times home production has been instituted where change in design has been desired, but only after refusals on the part of manufacturers to make the desired modification, or the cital of an exorbitant figure.

Call for Modifications.

While it is oftentimes a fact that firms call for modifications to meet mere personal fads, it is also true that others base their demands upon actual practical experience sufficiently prolonged as to exhibit the inherent defects of machines already in use. A case in point is that of a large firm engaged in the manufacture of goods in which press work predominates. Initially presses of various standard makes were installed —both British and American. In use certain defects revealed themselves and as a rule, the British machines suffered by reason of unwieldiness, unhandiness, and inaccuracy; the American on the counts of lack of durability, lightness of structure, and liability to frequent breakdowns.

The facility for adjustment of tools and work, and general handiness resulted in the eventual adoption of American machines, notwithstanding the fact that by reason of greater stability the British machine had a greater yield so far as total output was concerned. Accuracy of output here was the determining factor, although the saving in toolmakers' time in making adjustments was not a minor consideration.

A Combination Unit.

As productive demands grew, it became more and more a necessity to reduce troubles and expense consequent on breakdowns. Hence steps were taken to produce an experimental machine incorporating all the knowledge gained by a long experience. A machine was eventually evolved combining the stability of the British machines with the handiness of the American. Sliding surfaces were increased, the diameter of journals enlarged, and quality of materials chosen to give the improvements in strength shown to be necessary.

Under test, this machine gave unlooked for results, the speed of production being increased by nearly 50 per cent., and the annual output, by reason of freedom from "hold-ups," due to breakdown, increased some 75 per cent. Power requirements, relative to output, had also decreased. A batch of machines was put in hand, incorporating slight improvements such as were suggested in the testing of the first machine. These machines were subjected to systematic observation and in a subsequent batch still further improvements, with corresponding increase in output, were made. The same procedure has been followed up, with the result that the annual output over the original machines has gone up some 300 per cent., and the repair and power bills relative to output have decreased considerably.

Decreased Vibration Feature.

Press makers will be interested to learn that the main cause of increase in output was due to features which decreased vibration. For instance, the base supporting the die was eventually made absolutely solid instead of hollow, as is the common practice. The value of increased weight here was realized only by degrees. At each improvement the metal in the base had been thickened up until only in the last batch was solidity reached. The different batches are running in rows, side by side, and the witness cannot fail to remark the difference, for the last machines installed are silence itself, compared even with those of the previous batch, although the speed is greater.

The Specialty Handicap.

Meantime, makers of standard presses are in practically the same place they were in the beginning. In many instances, even improvements are regarded as impossible. One reason for this tenue on their part is that they so very rarely have an opportunity of subjecting their machines to an extended test, for press manufacture demands little or no press work. They would, indeed, be better capable of delivering judgment on other classes of machinery, the machines used in the production of presses. This is a dictum applicable generally to manufacturers of machines outside those which are classed as machine tools proper.

A Remedy in Effect.

How can this condition of things be improved? A reply is forthcoming in the policy of certain American firms, the Norton Grinder people, for instance, who advertise "grinders and grinding." Without any doubt, the experience gained on outside work thus undertaken is conducive to improvement in their production proper—grinding machines.

An argument which might be presented against this procedure is that it would be impolitic for a firm to compete against its own customers, but is the argument, all things considered, a legitimate one? No firm who has already adopted grinding methods, would consider for one moment the policy of putting out work, except under "rush" conditions. Firms who however, have not yet been induced to instal grinding machines, are at times compelled to get a certain amount of grinding done.

The grinder maker who caters for outside work would naturally be resorted to in such cases, particularly as his prices are likely to be reasonable, owing to the two interests involved. In the event of the firm whose work has been undertaken, deciding finally to save the profit paid to the grinder-maker, the chances are that the latter, by reason of experience on the actual work, will be able to give guarantees which will secure for him the order for the required machine. He would, at least, have the preference.

Similarly, makers of automatic machines might be well advised to undertake the production of bolts, nuts, and small machine parts; makers of forging presses, the production of forgings and so on. This would be far preferable to the usual practice of wasting material and time in the production of scrapheaps.

CARE OF ABRASIVE DISCS.

THERE is a right and a wrong way to take care of your stock of abrasive discs, says the Gardner Grinder, and it is for those who keep their discs improperly that these few lines are intended You keep your stock of steel castings, belting and other material in a systematic manner, and, likewise your abrasive discs deserve equal attention—possibly more so, owing to their somewhat fragile nature.

Like anything else you should have a place to keep your discs until it is required to use them. If your stock room is damp, don't store your discs there—dampness and excess moisture have a deteriorating effect on the bond, or glue. Never store your discs in a damp basement, or against steam pipes or any place where they are liable to be wet. Your cupboard for discs should be in a dry place, and, if possible, conveniently located near the wheel press and machine.

They should be stacked up flat; do not stand them on edge as this will cause them to become curved, which, on coarse grades, may result in difficulty when you come to attach them to the steel disc wheel. If when stacked up flat there is a tendency for them to "curl"—and sometimes this happens in prolonged damp weather—place a circular board on top of stack and weight it down. Discs which have always been kept dry and flat should work with complete satisfaction.

Do not bend a disc so as to "crack" it. One which has been so cracked is not ruined but it may not give full efficiency. Separate the various grades and sizes from each other. This enables you to avoid error when selecting a new disc, and you can also tell at a glance the amount of stock you have on hand at all times.

FERMENTATION OF SAWDUST.

A LARGE English company has begun the commercially successful production of acetone and fusel oil from sawdust by a simple process of fermentation. From these two products isoprene can be derived, which latter can be changed into rubber, merely by allowing it to lie in contact with a small quantity of the metal sodium. This synthetical rubber vulcanizes readily and compares favorably with the natural product in resilience, durability and price.

Acetone is used in the manufacture of cordite, and fusel oil is used in the manufacture of artificial leather cloth. Previously it was chiefly obtained as a by-product in the manufacture of whisky, brandy and vodka, but by this new process it can now be extracted much more cheaply, making possible a large profit. It is calculated that these bye-products of sawdust are worth almost $400 a ton. As it takes only ten tons of sawdust to yield a ton of these valuable constituents, the resultant profit is obvious.

In Europe, with its densely populated regions contiguous to the forests, the elimination of wood-waste is an economic essentiality, and hence methods have been evolved which, in some cases, utilize even the leaves and roots of trees. While this is not essential in America at present, it is desirable to reduce the waste which takes place in the different processes of transforming the standing timber into finished product, which amounts to something like fifty per cent. of the total volume of the tree. To this end, the Canadian Government is establishing a fully equipped Woods Products Laboratory at McGill University in charge of Mr. A. G. McIntyre, B.A., B. Sc., under whose direction experiments will be conducted to discover new uses for common Canadian trees and for the enormous quantities of sawdust and other forms of waste wood which now represent a money loss to the country of millions of dollars annually.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

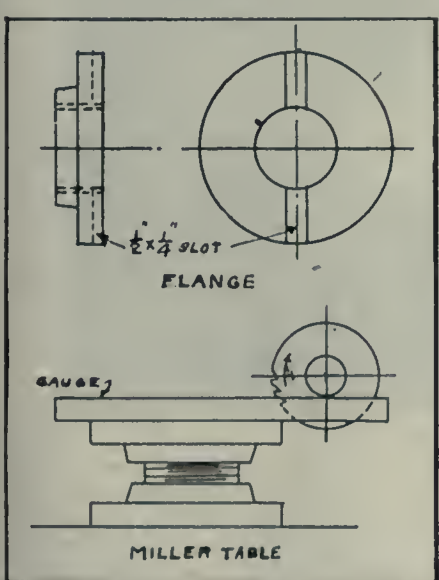
INEXPENSIVE MILLING FIXTURE.

By Don. A. Hampson.

A SHOP manufacturing cast iron pipe fittings sent in a thousand 3x6 flanges to be milled—work for which they were not equipped. The flange and the slot to be milled are shown in the drawing—the slot to be diametrical with the hole and its depth within 1-100 inch of truth with the machined face, which was square with the threaded hole.

Now there are few classes of work in which manufacturing methods have been been "intensified" more than pipe fittings—competition is keen and prices are primed down to the last fraction of a cent. Any subsequent work put on such an article has, of necessity, to be in some kind of proportion to the original cost—a buyer would look askance at say ten cents worth of extra work put on a ten cent flange. We knew this, and moreover were asked to make a rock bottom figure on the job. Some sort of fixtures were, of course, required but as there would be no more of the work after this lot, they had to be of the cheapest kind. In the end, it cost only $3 to make the fixture and set up ready to mill, and, when all the flanges were finished, we had left on our hands the following items:—½ lb. of machinery steel and two 3-in. nipples 2 inches long. Just a word of explanation.

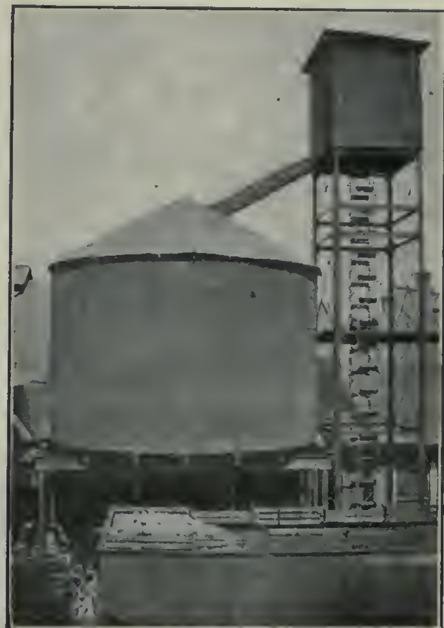
Having secured two short 3-in. nipples from a plumber, they were screwed into two of the flanges as tightly as possible. Then the flanges were put on the faceplate of the lathe and the exposed threads trued up with a tool, making them, or rather their imaginary centre line, perfectly square with the face of the flange. These flanges were bolted to the tables of two knee type millers which were situated next to one another. One boy could then run two machines.



INEXPENSIVE MILLING FEATURE.

In setting the cutter, it was centred on the threaded nipple: this made all cuts diametrical on the flanges to be milled. To get the depth, individual measurements had to be made on each flange because some would screw on farther than others. These measurements were made as follows:—The flange having been screwed down fairly secure, it was run up to the cutter and the feed put on, then a strip of flat steel which had been made the correct width was used as a gauge between the flange being cut and a collar on the arbor.

By holding the gauge flat on the face of the flange, it could be slid along until it either touched the collar or passed under it. If the former, the table was dropped a little, and the latter, it was raised until it just touched the collar and no more. The construction of the knee type miller made it particularly adaptable to such a setting, the trick of which the boy readily acquired.



A COKE ELEVATOR.

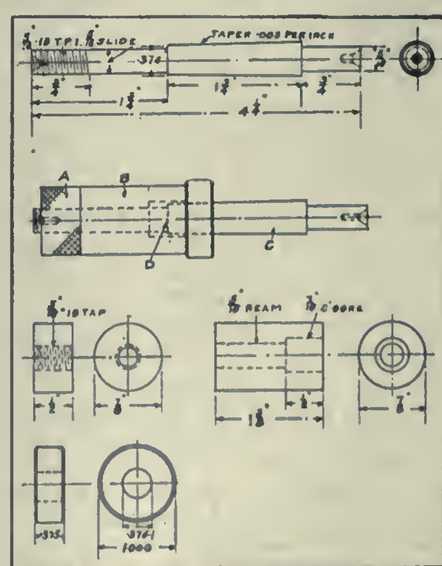
A COKE ELEVATOR.

THE accompanying cut shows a coke elevator used by a large Western iron works. The bucket chain is run by a small electric motor, and the coke is automatically dumped into the upper chute, and slides into the middle of the metal bin, where it is kept dry ready for use, and safe from the disintegration that takes place in coke exposed to the weather. The method of using this elevator is to run a car up on the siding, close to it as shown, and then two men drop the coke down a short chute, so that it will slide into the buckets as they rise. The space under the storage bin is used to store pig iron, which is elevated to the top of the furnace by means of a power operated lift.

ARBOR FOR GRINDING SMALL ROLLS.

By J. Baker.

THE arbor in the accompanying illustration was designed for the purpose of holding the roll shown, while grinding the circumference. The outside surface of the rolls was required to be perfectly straight and parallel with the reamed hole in the centre, and also to be concentric with the hole. It was first tried to do the job using a straight arbor, but as it was impossible to hold the reamed hole to exact size without lapping, it proved to be a very expensive operation, and if the hole was not lapped the work was often not concentric. The



ARBOR FOR GRINDING SMALL ROLLS.

special arbor shown here overcame all the difficulties encountered in the previous methods, and proved very quick and economical in use.

The arbor consists of three parts; a knurled nut (A), a collar (B), and the arbor proper (C). By referring to the sketch, it will be seen that the reamed hole is .376 with an allowable variation of minus .001, making the smallest allowable diameter, .375. As the portion of the arbor (C), when the work is placed, is tapered, the diameter at (D) is made one thousandth less than the small diameter of the reamed hole, or .374, in order to assure the work going on the arbor. From (D) the arbor is tapered .005 per inch for a length sufficient to allow a roll with a hole the maximum size to be held, and beyond this point, is turned straight to a shoulder for attaching a dog, and has a female centre in the end to fit the grinding machine.

The other end of the arbor is turned straight and smooth to fit the hole in the collar (B) and the extreme end is threaded for the nut (A). The work is placed on the arbor, and is pushed along until it stops, when the collar is placed against it, and then the nut is tightened, holding it securely in place and against turning. As the face of the collar (B) presses against the side of the roll, it will be seen that the work is thus held perpendicular to the centre of the arbor, thus assuring the circumference being parallel in the hole. The arbor being tapered, assures concentricity. The collar (B) is counterbored to clear the end of the tapered portion of the arbor.

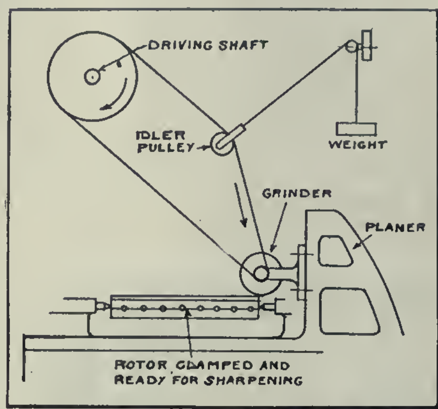
This is the best method for holding work of a like kind that the writer has yet seen.

A CRUDE GRINDING JIG THAT WORKED.

By N. G. Near.

ONE is often amazed, after building a crude machine, die, jig, or what not, to find that the creation "works." I have many times stood by and pondered over the dependability of a gasoline engine, for example, working on the hit and miss principle with noisy, loose, erratic-looking and active levers that seem to evidence surprise themselves every time they strike the notch or cam that the designer intended they should strike at the proper moment. Can it be that God guides these levers? Most machine tools, praise be, are sanely designed.

Not long ago, when in charge of a machine shop out West a gentleman came in with the rotary cutter of a woodworking planer. On the rotor were the usual two blades which were badly nicked and needed considerable grinding. I presume I could have turned out a satisfactory job by merely grinding the blades on my emery wheel and lining the edges accurately with a straight edge or surface plate, but I was in a mood to tinker, bethinking me of my large planer and planer centres on which I could quickly centre and clamp the shaft of



A CRUDE GRINDING JIG THAT WORKED.

the rotating element. I thought I saw my way clear to making a jig that would turn the trick more quickly than by the method I would ordinarily have used.

So, after centring the piece carefully I bolted a small bench grinder to the planer head and then constructed a belting arrangement as shown in the figure. At the time I made the device, and while I saw the sparks flying from the wheel, I was somewhat elated and called the attention of all of my men to its success, and, of course, told the owner of the woodworking plant as well as chance visitors all about it.

Before now, however, I have several times wondered that the idlers did not kill somebody. It was the extreme of crudity, with rough iron straps and plenty of ragged edges and sharp corners to catch the belt as it passed over the idler pulley. Had the idler caught, the weight certainly would have been pulled over the beam at high velocity, and somebody would have been in serious danger.

I can now see that an idler would have been unnecessary. I could have brought the grinding wheel down to approximate grinding position, and could have laced the belt on tight. The elasticity of the belt would have given plenty of latitude for vertical adjustment of the grinder on the planer head, while the width of the pulley on the driving shaft cared for horizontal feed.

METHOD OF SPLICING PAPER AND CLOTH BELTS.

ADVERTISEMENTS relating to improved machinery are usually read with a quaking heart by a large number of workmen, says H. H. Miller, in the Abrasive Age, as many of them are apt to think that it is their scalp which is referred to in the statements that the machine will do the work of several men, and in half the time. They do not stop to think that these machines, or nearly all of them, will require men to attend to them. If some of the workmen who keep their finger nails down to the quick, pushing a sandpaper block, could see the working of a good up-to-

THE FINISHED SPLICE.

date belt sander, I believe they would welcome the opportunity to run one. In operating these machines there is much more opportunity to become a skilled man than at the bench, and the work is so much easier.

I am frequently questioned concerning the splicing of paper and cloth belts, and which method is the most generally used. In this, as in numerous other operations, there are different ways of getting practically the same result, and while shop conditions, machine makeups and finish required in a measure affect belt slicing, yet there are some operators who think that, as long as this or that method gets by, why experiment with other methods.

My experience is that the panel paper belt operators mostly use the interlocking belt-splicing dies, cut at an angle of 45 degrees and some at right angles, backing up the splices with a very light cloth. The straight, butted end splice, cut on the bias, is the favorite on high-speed machines carrying cloth belts, while on the slower speed machines, I find the operators lapping the ends, one of which has had the sand soaked off, while others lap them just as they are cut. These lapped splices are generally made at right angles.

One of the prominent chair manufacturers in Gardner, Mass., has, in my opinion, the best method for splicing cloth belts. It is a method which is extremely simple and can be carried out by a fifteen-year-old boy. By this method belts are produced that neither jump nor pucker, that are never even found to start at the splice, and the full life of the cutting material is obtained. The method is as follows:

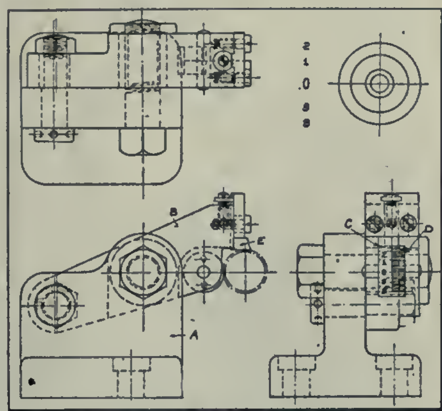
A 24-inch straight edge is fastened to the back of the bench, to one end of which is bolted, at an angle of 45 degrees, a 20-inch discarded planer knife, cutting edge up. To the back end of this and edge down, is bolted another knife having a wooden handle; this forms the shear. Underneath the bench is swung the roll of cloth, and this is brought up over the end, grain side down, a wooden roller keeping it from fouling the knife. After being cut, the belts are suspended from a convenient arm overhead, making them easy to handle. The ends are then butted and secured with sharp-pointed nail blocks.

The splice is covered with moistened gummed tape one inch wide and several strips two inches wide are run across the splice lengthwise with the belt. Two dozen of the belts are made up at a time, and the whole batch is put in a homemade hand press. At the end of twenty minutes they are taken out and hung up for an hour to dry, after which they are ready for use. The neatness and despatch with which these belts are turned out is well worth the trouble and small outlay required.

ROLLING NUMBERS ON NUMBER WHEELS.

By A. M. Rochester.

In adding machines and cash registers, there are a number of wheels used in the mechanism, having a series of figures around the circumference, usually running from 0 to 9, and to stamp these numbers on the wheels is a problem requiring much thought as to the best method to be adopted. When rolling them, it is usually hard to make the stock and the master wheel register correctly for more than one turn. If they do not revolve at exactly the same rate, the figures on the master wheel will not engage on the next turn with the depressions on the stroke, and therefore, cause a poor job. It is usually necessary to revolve the master wheel against the stock several turns in order to have the impression deep enough so that they show up well.



ROLLING NUMBERS ON NUMBER WHEELS.

In one shop, where these wheels are manufactured, we use the fixture shown herewith, in connection with the screw machine. The stock is fed out for the turret operations of drilling and reaming the centre hole, and is formed by the rear slide tool. On the front slide is mounted a regular circular tool holder (A), to which is mounted a carrier (B). To the latter is attached a master wheel (C), which rolls the letters or figures on the stock, and doweled to this wheel is a knurl (D). The purpose of this knurl is to engage the stock and keep it from slipping as it revolves, so that the master wheel is sure to follow the marks made by the first revolution. On top of the carrier (B) is mounted a shaving tool (E), which shaves off the marks made by the knurl before the piece is engaged by the master tool.

This is a most simple and economical method of producing such wheels.

FORMULÆ FOR COIL SPRINGS (HELICAL)

MAX SAFE LOAD IN lbs ON SPRING $= \frac{KD^3}{R}$

AND THE LOAD IN lbs TO DEFLECT THE SPRING 1 INCH OR THE RATE $= \frac{CD^4}{NR^3}$

WHERE D = DIA OF WIRE IN INCHES

R = MEAN RAD OF COIL IN INCHES

N = NUMBER OF COILS

C = MODULUS OF TRANSVERSE ELASTICITY = 180.000

K = STRESS PER SQUARE INCH = 12.000 FOR 3/8" AND 10.000 " 1/2" DIA WIRE.

H. ROBERTS

TABLE GIVING MEAN RAD: OF COILS.

1/16	·0002441	7/16	·083740	13/16	·536377	1 3/8	2·5996
3/32	·0008240	15/32	·102997	27/32	·600677	1 7/16	2·9705
1/8	·0019531	1/2	·125	7/8	·669922	1 1/2	3·375
5/32	·003816	17/32	·149938	29/32	·744993	1 9/16	3·8197
3/16	·006592	9/16	·177979	15/16	·823975	1 5/8	4·2910
7/32	·010468	19/32	·209320	31/32	·909149	1 11/16	4·8059
1/4	·015625	5/8	·244141	1	1·00	1 3/4	5·3594
9/32	·022297	21/32	·282623	1 1/16	1·1995	1 13/16	5·9593
5/16	·030518	11/16	·329951	1 1/8	1·4238	1 7/8	6·5918
11/32	·040619	23/32	·371307	1 3/16	1·6746	1 15/16	7·2732
3/8	·052734	3/4	·421875	1 1/4	1·9531	2	8·00
13/32	·067047	25/32	·476837	1 5/16	2·2610		
R	R^3	R	R^3	R	R^3	R	R^3

DATA RELATIVE TO COIL SPRINGS.

DRILL PRESS ACCIDENTS AND PREVENTION SUGGESTIONS.

W. H. DOOLITTLE, Safety Inspector, National Metal Trades Association, writing in the columns of "The Review," deals with drill press accidents, and makes a number of suggestions relative to the prevention of the latter.

To the Designer and Builder.

It was a wise man who said: "We must build machinery for fools to use." Put yourself in the place of the operator. He is often a green boy who never saw a drill press before the day he came into the shop and was set to work drilling holes. Don't leave gears exposed for him to mutilate his fingers with. If the machine is driven by a heavy belt, running onto a pulley near the floor, design a guard or screen to go with the machine and prevent his clothing from being caught.

If it is a swift running, sensitive drill it will be a humane act for you to design and put on a cover which will prevent the operator's hair from being wound up by the spindle.

To the Purchasing Agent.

Every new machine which comes into the shop is admitted by your orders. It is your prerogative to prevent unguarded machines from entering the plant. Each order for a machine tool should contain specifications as to its thorough safeguarding. Every manufacturer will furnish guards with machines if they are required.

To the Foreman.

You are a practical man and probably were a drill press operator long before you became a foreman. You are acquainted with the dangers of drill press operation. It is incumbent upon you more than any other person to prevent the operator from performing his work in a dangerous manner.

One of your important duties is to prevent those in your charge from being injured. Take time to instruct the new operator. Be sure that he understands how to safely operate and care for his machine. Keep safe operation constantly uppermost in your mind. Don't allow fooling or horse play in your department.

To the Operator.

It is necessary for you to know and to remember that you may be injured in connection with your work if you are careless and inattentive. If the job is a large one, stop the machine before putting it in position or your clothing may be caught by the drill. Use sharp drills; dull tools cause undue friction After placing the job on the table of the drill press and lining it up with the drill be sure to secure it to the table so that it may not be whirled in case the drill sticks in the work. Tighten the clamp bolts of the table and of the swinging arm before you start to drill.

You should on no account use your fingers or a piece of waste to remove chips from the drill while it is running. Better use a brush or a stick for this purpose. If the nature of the work requires the wearing of gloves they should be of leather and kept in good repair. Gloves made of textile fabrics are dangerous, also leather gloves that have become ragged.

If the drill breaks in the work do not attempt to remove the pieces with a chisel without first annealing the broken parts. Operators have lost their eyesight in this manner. When the point of the drill comes through the work, there is a tendency on the part of the drill to "hog" into the work and an accident may occur if caution is not used. The "hogging" is caused by the back lash or end play in the spindle, and the decrease in the area of the surface being acted on by the cutting edges of the drill.

It is very risky to get your head near to the drill when it is running. The drill may catch your hair and tear off part of your scalp. Female operatives have been frightfully injured in this way. Another reason for keeping your head away from the drill is that, if it breaks a piece of it may enter your eye and destroy its sight.

If the drill catches and whirls the work do not attempt to stop it with your hands but get out of line and throw the belt shipper or switch over as soon as possible.. Do not insert the drift in the spindle slot in order to remove the drill until the machine has come to a full stop. Never, under any circumstances, wipe or clean the machine when it is in motion.

NOTE	D		D^3	D^4	K	KD^3	CD^4
	S.W.G.	INCHES					
FOR SQUARE WIRE. MULTIPLY RESULTS OBTAINED FROM TABLE. BY 1·36"		0·625	0·244140	0·15259	8000	1953·12	27466·00
		0.5625	0·177980	0·10011	9000	1601·82	18020·00
		0·500	0·125000	0·06250	10·000	1250·00	11250·00
		0·4375	0·083740	0·036636	11·000	921·14	6595·00
	4/0	0·400	0064010	0·025600	11600	742·520	4608·720
		0·375	0·052734	0·019775	12000	632·808	3560·000
	3/0	0·372	0·051460	0·0191400	12048	620·100	3445·760
	2/0	0·348	0·042150	0·014670	12432	523·900	2640·270
		0·34375	0·040619	0·013963	12500	507·730	2513·000
	0	0·324	0·034000	0·0110160	12816	435·600	1982·880
		0·3125	0·030518	0·009537	13000	396·730	1717·000
	1	0300	0·027000	0·008100	13200	356·400	1458·000
		0·28125	0·022247	0·0062571	13500	300·330	1126·000
	2	0·276	0·021020	0·0058000	13584	285·400	1044·270
	3	0·252	0·016010	0·0040340	13968	223·500	726·2136
		0·250	0·015625	0·0039063	14·000	218·750	703·000
	4	0·232	0·012480	0·00289500	14288	179·500	521·1648
		0·21875	0·010467	0·002290	14500	151·770	412·000
	5	0·212	0·009520	0·0020180	14608	139·000	363·2832
	6	0·192	0·007080	0·00135900	14928	105·500	294·6156
		0·1875	0·006592	0·001236	15000	98·88	222·000
	7	0·176	0·005450	0·0009600	15184	82·730	172·6560
	8	0·160	0·004090	0·00065500	15440	63·250	117·96480
		0·15625	0·003815	0·0005960	15500	59·130	107·000
	9	0·144	0·002980	0·0004290	15696	46·760	77·24160
	10	0·128	0·002100	0·0002688	15952	33·500	48·3840
		0·125	0·001953	0·00024414	16000	31·250	49·000
	11	0·116	0·001560	0·00018090	16144	25·1800	32·57280
	12	0·104	0·001125	0·00011700	16336	18·3700	21·06000
		0·09375	0·0008239	0·00007725	16500	13·5900	14·000
	13	0·0920	0·000778	0·00007160	16528	12·8500	12·88368
	14	0·0800	0·000512	0·00004096	16720	8·5620	7·37280
		0·078125	0·000479	0·00003749	16750	8·023	6·748
	15	0·0720	0·000373	0·00002685	16848	6·2840	4·8340
	16	0·0640	0·000262	0·00001678	16976	4·4470	3·01824
		0·0625	0·000244	0·00001526	17000	4·1480	3·000
	17	0·0560	0·000175	0·00000983	17104	3·0030	1·7700
	18	0·0480	0·000111	0·00000530	17232	1·9050	0·95560
		0·046875	0·000103	0·0000048	17250	1·776	0·868
	19	0·040	0·000064	0·00000256	17360	1·1110	0·46080
	20	0·0360	0·000047	0·00000168	17424	0·7769	0·30196
	21	0·0320	0·0000328	0·00000105	17488	0·573	0·190
	23	0·0240	0·0000138	0·00000033	17616	0·243	0·060
	28	0·0150	0·0000034	0·000000051	17760	0·060	0·009

DATA RELATIVE TO COIL SPRINGS.

DEVELOPMENTS IN MACHINERY

A Record of New and Improved Machinery Tending Towards Higher Quality and Economical Production in the Machine Shop, Blacksmith Shop or Planing Mill.

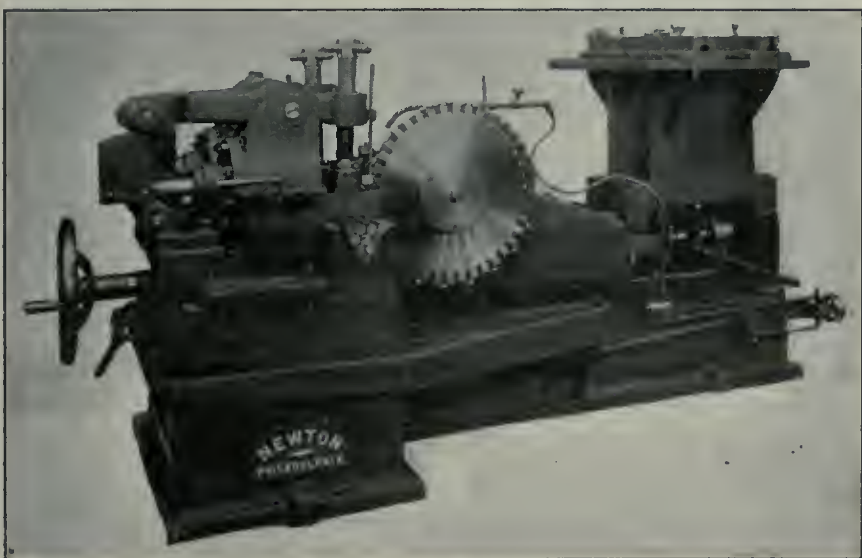
COLD METAL SAWING MACHINES.

THE accompanying photographs show the modern equipment of cold metal sawing machines furnished to fill requirements for sawing off 900 pieces of 1⅜ inch special heat treated stock in 10 hours, the machines being driven by a General Electric Co. motor, and fitted with air operated clamps and stock trolley to reduce resetting time.

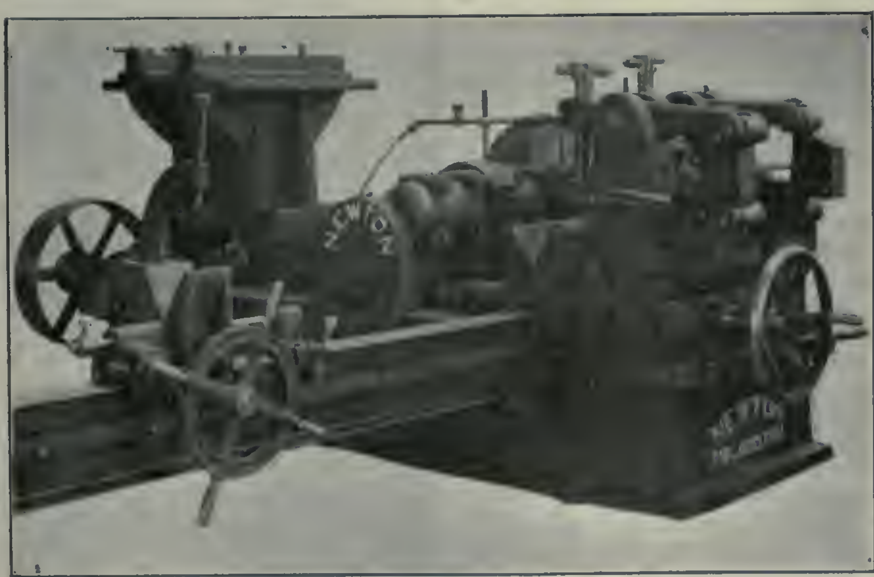
Each machine carries a 26 inch Taylor-Newbold new type inserted tooth saw blade, and is fitted with pump, piping and attachments to insure ample flow of cooling fluids. The tee slots for holding the air clamps are placed at right angles to the direction of travel of the spindle saddle, and the work table, shears, extension of the base supporting the driving and feed mechanism, and the oil pan are solid castings. The spindle is of large diameter, revolving in bushed capped bearings at each end, and the parts throughout are of alloy steel and bronze, with the exception of the hand wheel and a few levers, which are of malleable iron.

To maintain rigidity, the saddle has underlocking gibs, cast solid, and vertical and horizontal fits maintained by taper shoes. The feed screw has a bearing at each end to insure its operating in tension, and the feed changes are obtained through a gear box giving changes without removal of gears. The machine is, properly speaking, in the milling class, and, for this reason, the chief consideration in design and construction was the elimination of chatter, while insuring the maximum output of which the modern inserted tooth blades are possible.

The Newton Machine Tool Works, Inc., Philadelphia, are manufacturers of these equipments.



NEWTON COLD METAL SAWING MACHINE.



NEWTON COLD METAL SAWING MACHINE.

BARREL TYPE SAND BLAST MACHINE.

A SAND blast machine of the barrel type for cleaning small and medium-sized castings and doing kindred work, which embodies several features new in design, is being manufactured by the De La Vergne Machine Co., Mott Sand Blast Department, New York.

For the new device, the simplicity of which is apparent from the illustrations, is claimed great economy of air and general efficiency of operation. It is entirely self-contained and skilled labor is unnecessary in its operation. The application of the air is by only one nozzle, as may be seen. The nozzle oscillates on the line of the axis of the barrel and throws the blast and grit along a line coincident with the axis. The movement approximates the moving of a nozzle steadily back and forth by hand, the air and grit being directed at the work instead of the work being brought under the blast. By this arrangement cleaning is accomplished with one ¼-in. nozzle, and surfaces are reached which otherwise would require several nozzles.

The barrel is made of one piece of 5-16-in. steel boiler plate and built within two heavy cast-iron rings which support it and in turn are supported by four cast-iron flanged wheels on which the barrel revolves. The barrel is perforated in such a manner that it serves as a screen, the abrasive material falling through and converging in a hopper under the barrel. From the hopper it is drawn by suction through a feed hose to the nozzle and used over and over again.

In first starting the machine, after the power is connected, all that is necessary is to place grit in the hopper. The barrel is closed at the operating end by a sliding clamp door which revolves with the barrel and can be opened when the latter is at any position. About a quarter turn of a small handwheel unlocks the door which is carried on a trunnion bearing which in turn is supported by a bracket on the case.

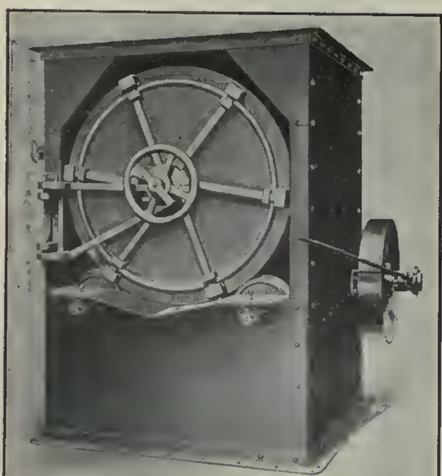
Constructional Features.

The case is constructed of 3-16 in. steel plates riveted at the corners to a $2\frac{1}{2}$-in. extra heavy angle iron which is carried around the top and bottom. At the work end of the barrel is a shelf which enables the cleaned castings to be raked from the barrel into a wheel-barrow.

The flanged wheels supporting the barrel are keyed to 2-in. shafts which run in boxes attached to and outside of the case and which are driven by wide-faced gears meshing with beveled pinions as shown herewith. The shaft carrying the pinions is driven by a jaw-clutch pulley 24 in. in diameter with a 3-in. face. The speed of the pulley should be 24 r.p.m., giving a speed of 2 r.p.m. to the barrel. Owing to the slow speed, it is pointed out that delicate castings with sharp corners are not injured, as the revolving of the barrel is solely for the purpose of presenting all sides of the stock to the blast.

The oscillation of the blast nozzle is obtained from an eccentric keyed to the driving shaft. The oscillating feature is interesting in its operation as well as important from the viewpoint of economical use of air. The feed is accessible as may be seen from the rear view of the machine.

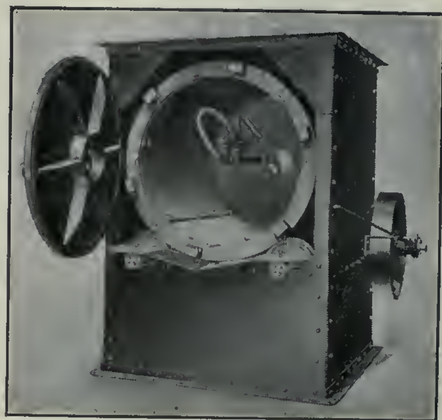
A 6-in. hole to which may be attached a pipe running to an exhaust fan is located near the top of the back of the case. Where an exhaust fan is used, the dust can be discharged in the outer air, through a chimney or otherwise.



FRONT, MOTT SAND BLAST MACHINE.

The operation of the mechanism is controlled from the work side of the machine by one lever for opening the air valve and another for operating the jaw-clutch pulley. The pulley can be placed at either end of the drive shaft to suit convenience, though it usually is placed at the right-hand side. All of the bearings of the machine are outside of the case and protected from dust and grit.

In its own plant the manufacturer has cleaned phosphor bronze crankshaft boxes weighing 60 lb. each, although the machine is not recommended for



INTERIOR, MOTT SAND BLAST MACHINE.

such large work. Under tests, there also have been cleaned drop forged steel hooks for galvanizing, and the results were pronounced very satisfactory by the platers. The use of angular grit is recommended. The machine in tests conducted by the makers has thoroughly cleaned cored brass castings in 200-lb. lots in 3 min., grey iron in 4 to 8 min., and removed the scale from malleable tees in from 10 to 15 min. It has operated successfully on brass castings at 40-lb. pressure, the manufacturers assert, but about 80 lb. is advocated, as better results are then assured.

The use of long nozzles is advised, as the sand then impinges with greater force on the work and consequently the cleaning is done more rapidly. With bulky pieces, however, short nozzles may be used, thus giving greater clearance between the shell of the barrel and the end of the nozzle. Several nozzles, which are the only part of the machine to wear out, are supplied with it and they can be readily made by any foundryman.

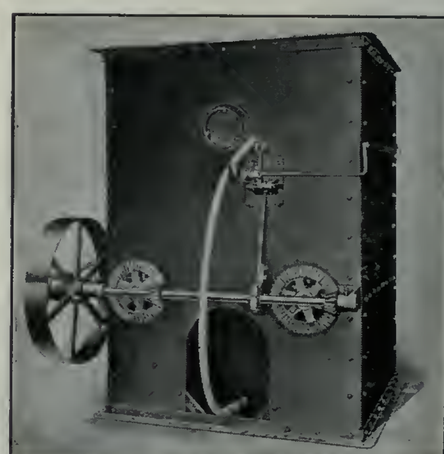
DUPLEX CAR BOX BORING MACHINE.

THE Detrick & Harvey Machine Co., Baltimore, Md., have recently put on the market a machine built particularly for boring car journal boxes, but also capable of being used for other machine work of a similar nature. Some idea of the general design of the machine may be obtained from the accompanying illustration. It is substantially a double unit. The motor, which is fixed on a bracket, and forms a contained feature of the machine, drives two parallel spindles through gearing, each spindle in turn driving a boring bar, one on each side of the machine. A pair of the parts to be machined are placed in a pair of jaws on opposite sides of each boring bar, so that four boxes are machined at one time. The machine is, in a word, a production of relatively special application, capable as a result of a high production, particularly where numerous articles of the same general type have to be finished.

As regards the machine in general, it may be noted that the bed is of the double shear type, $45\frac{3}{4}$ in. in width over all, and $12\frac{5}{8}$ in. deep, supported on two pedestals. The centre of the spindle bearings is 13 in. above the top of the shears, and the spindles are of cast iron, $4\frac{1}{4}$ in. in diameter, with 17 in. bearing in the headstock. The socket into which the boring bar is fixed is attached to a sleeve, and the sleeve is engaged or disengaged with the spindle by means of a sliding tooth steel clutch, the lever for which may be seen immediately above the head-stock.

The carriages have a sliding motion on the shears of the machine bed and may be operated by hand or power. There is a quick hand motion by means of the spider working on a rack, a hand wheel on the end of the lead screw, and power action by the spur gearing at the end of the bed, as stated. The little hand wheel shown operates a right and left hand screw for clamping the work in place, and the work is further held in the jaws by means of a hinge bolt spanning the space across the top of the jaws.

The feed screws are $1\frac{3}{4}$ in. diameter, and provision is made for protecting both the screws and the nuts from chips, by covers. As the motion to the feed mechanism is taken from the spindle, the

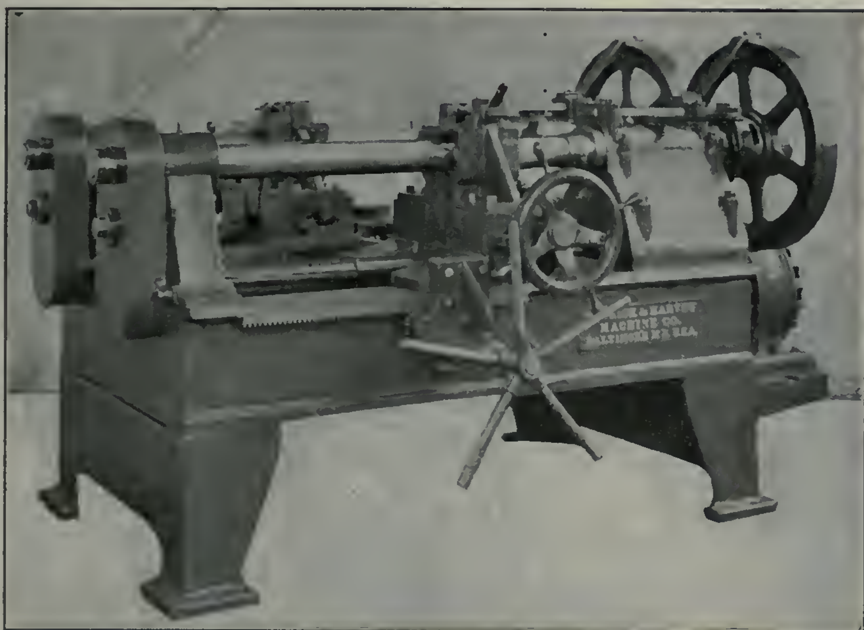


REAR, MOTT SAND BLAST MACHINE.

feed of one-half the machine is in action only when the corresponding spindle revolves. A $12\frac{1}{2}$ h.p. motor is ordinarily installed, with a speed variation of 1 to 2, giving spindle speeds of 25 to 50 r.p.m. and feeds to the carriage of 1-16, $\frac{1}{8}$ and 3-16 in. per revolution of the spindle.

There are three cutters wedged in each

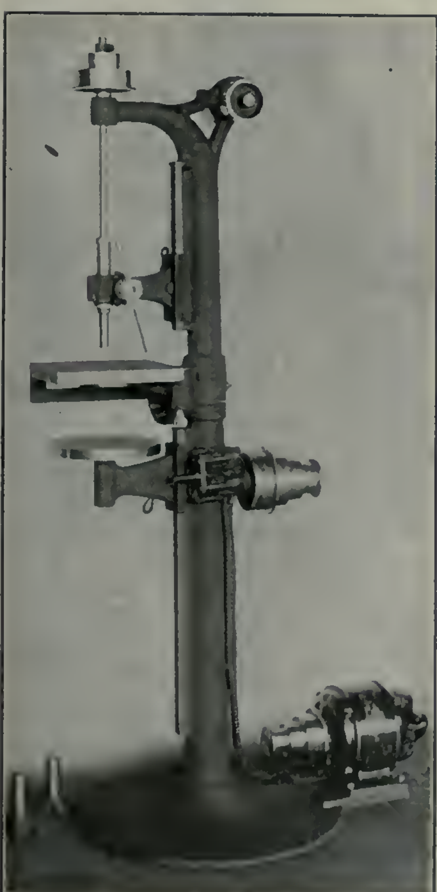
boring bar, one about the centre, which is provided to do the main work of boring; one toward the headstock of the machine, which cuts on a large radius out of the end of the boxes, and a third toward the opposite end of the bar, which cuts a small radius at the other end of the bored out surfaces. The boring bar has no longitudinal movement, but is secured to the end of the driving spindle in a socket, and at the far end runs in a bearing in what corresponds to a tailstock. In this are some change spur gears, which are made to revolve a



DETRICK & HARVEY 1913 MODEL DUPLEX CAR BOX BORING MACHINE.

lead screw extending along the machine underneath each carriage.

The carriage carries a split nut, which is made to close around the lead screw by means of a lever, and the carriage with the car boxes clamped in jaws is placed toward the headstock. After being bored by the middle cutter, the boxes are fed up to the cutter which cuts the large radius, the nut is then disengaged, and the boxes are fed by hand by means of the spider shown to the rear cutter, which finishes the operation as stated. The boring bars are of steel, 3 11-16 in. in diameter, for use in boring boxes 5 in. and larger in diameter, and the machine is designed to finish all sizes of boxes up to and including the 6 x 11 in. M. C. B. standard car box.

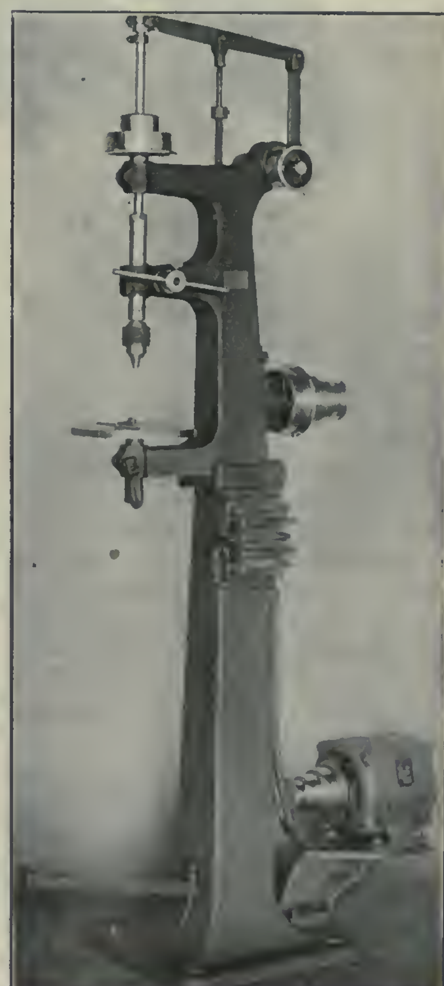


MOTOR DRIVEN DRILL.

MOTOR-DRIVEN DRILLS.

THE two drills shown in the illustrations are modernized designs of machines that have been on the market for many years. Motor drive is one of their conspicuous features. The addition of the motor makes the drill an independent unit, which can be installed wherever desired without reference to line shafts. The motor is stopped and started by a switch convenient to the operator. Each drill has six speeds obtained through cone pulleys, giving a range of from 600 to 2,400 r.p.m. The spindle has a ball thrust bearing.

The drills are made by the Francis Reed Co., Worcester, Mass., and are driven by Westinghouse motors.



MOTOR DRIVEN DRILL.

ROLL-OVER TYPE MOLDING MACHINE.

THE Osborn Mfg. Co., Cleveland, Ohio, have placed on the market a new type molding machine, known as the Osborn "Little Wonder," and which is being shown for the first time at the American Foundrymen's Convention and Exhibition during the present week. The flask or core-box can be filled, rammed rolled over, the mold drawn down and brought out clear, all without the operator once having to leave his position in front of the machine. During the whole operation there are no stops or locks to bother with. Rolling over the mold requires the least possible effort, as it revolves upon its own centre of gravity, and as most of the weight is slightly above this centre, it helps to carry the mold over, but does not bring it down with a jolt, as the cam brings it accurately to a stop at the right position. A screw shown in the illustration provides an adjustable contact point against the cam, so that the desired pressure can be secured. The mold or core is rammed by hand or foot-power, or by both.

A slight pressure of the foot brings the mold receiving table up into position. The Osborn four-pin leveling device adjusts itself to any unevenness of the bottom board, and all four pins are locked simultaneously by pushing the lever a few inches to one side. Pressing the foot treadle a second time lowers the table and brings the core or mold clear of the core-box or pattern. It is then pulled forward clear of the machine by the sliding arms, which pass through slots in the leveling pins.

General practice has shown that most core boxes can be sufficiently rammed by two or three jolts. It is also true that the ramming of many small molds can be greatly expedited by this same operation. To take advantage of this opportunity for lowering the cost of production, a special foot treadle has been provided at the side of the machine, whereby the jolting operation is performed. This is a rapid operation, requires but little effort, and the workman does not move from his position.

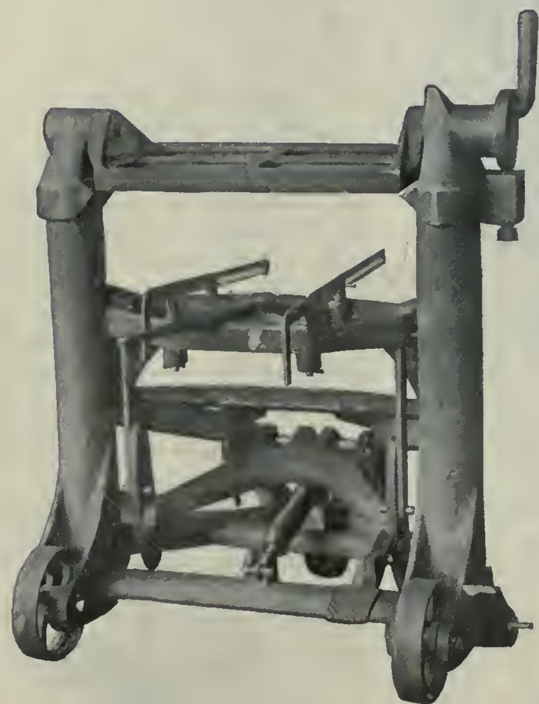
This machine is made in three sizes, each with 8-inch pattern draw.

No. 45—22 inches between trunnions.

No. 46—28 inches between trunnions.

No. 47—36 inches between trunnions.

Nos. 46 and 47, in addition to the regular 8-inch draw, are so designed that the pattern plate can be rocked out—thus securing additional draw if needed.



OSBORN NEW ROLL-OVER TYPE MOLDING MACHINE.

OSBORN NEW PORTABLE PNEUMATIC SQUEEZER MACHINE

AIR SQUEEZER MOLDING MACHINE.

THE Osborn air squeezer molding machine is designed to permit the free shovelling of sand beneath it. This unit is equipped with a valve which provides more or less automatic operation, and which can be adjusted to any desired pressure from 30 to 100 pounds per sq. inch. As soon as the desired compression is reached, the valve not only prevents additional pressure, but signals the operator, by the hiss of escaping air, that the mold is finished. He then removes his hand from the valve, and the machine automatically returns to its off position.

This valve regulator makes it unnecessary for the molder to watch the gauge to see when the right pressure is reached. After a mold is squeezed with the desired pressure, duplicate molds can be made of similar hardness by setting the valve at this figure. Speed can be readily controlled by the operator increasing or decreasing the amount of air.

Another advantage of the machine is that none of the working parts are at any time exposed to dust or dirt, the table being provided with a shield or apron, which comes down around the cylinder to a distance which is greater than the length of the ordinary stroke. The construction is simple, strong and substantial; an illustration of the way in which maximum strength is gained without unnecessary weight being seen in the strain-rods which are made of nickel steel. Furthermore. these rods are direct-connected to the cylinder casting, thus eliminating all tendency to spring the machine when in operation.

The handy character of the machine is increased by its convenient wheed-base and its equipment bracket, sponge pocket and parting-bag pocket. The machine is built in three sizes with 10, 13 and 16 in. cylinders and 32, 36 and 42 in. between rods. The largest size is built without a wheel base.

The Osborn Mfg. Co., Cleveland, Ohio, are the builders of this specialty.

LIFTING HEAVY FINISHED. CASTINGS.

IN lifting heavy finished castings, the edges are frequently damaged by indentation from the slipping of the chain slings, while if rope slings are used instead, these are soon destroyed by the sharp edges of the castings. A protector has now been designed by the Hess Steel Castings Co., Bridgeton, New Jersey. The protector is a casting consisting of two plate members at right angles to one another and a pair of stiffening ribs. The chain or rope rests between these ribs, between which the casting is thickened and rounded to give a good seat and prevent damage to the sling. The ribs are carried far enough back to receive a cotter pin, which ensures the protector always being in the sling when wanted. Provision is made against damage to a sharp edge on a finished casting or machine by running a groove lengthwise of the protector at the junction of the two plates.

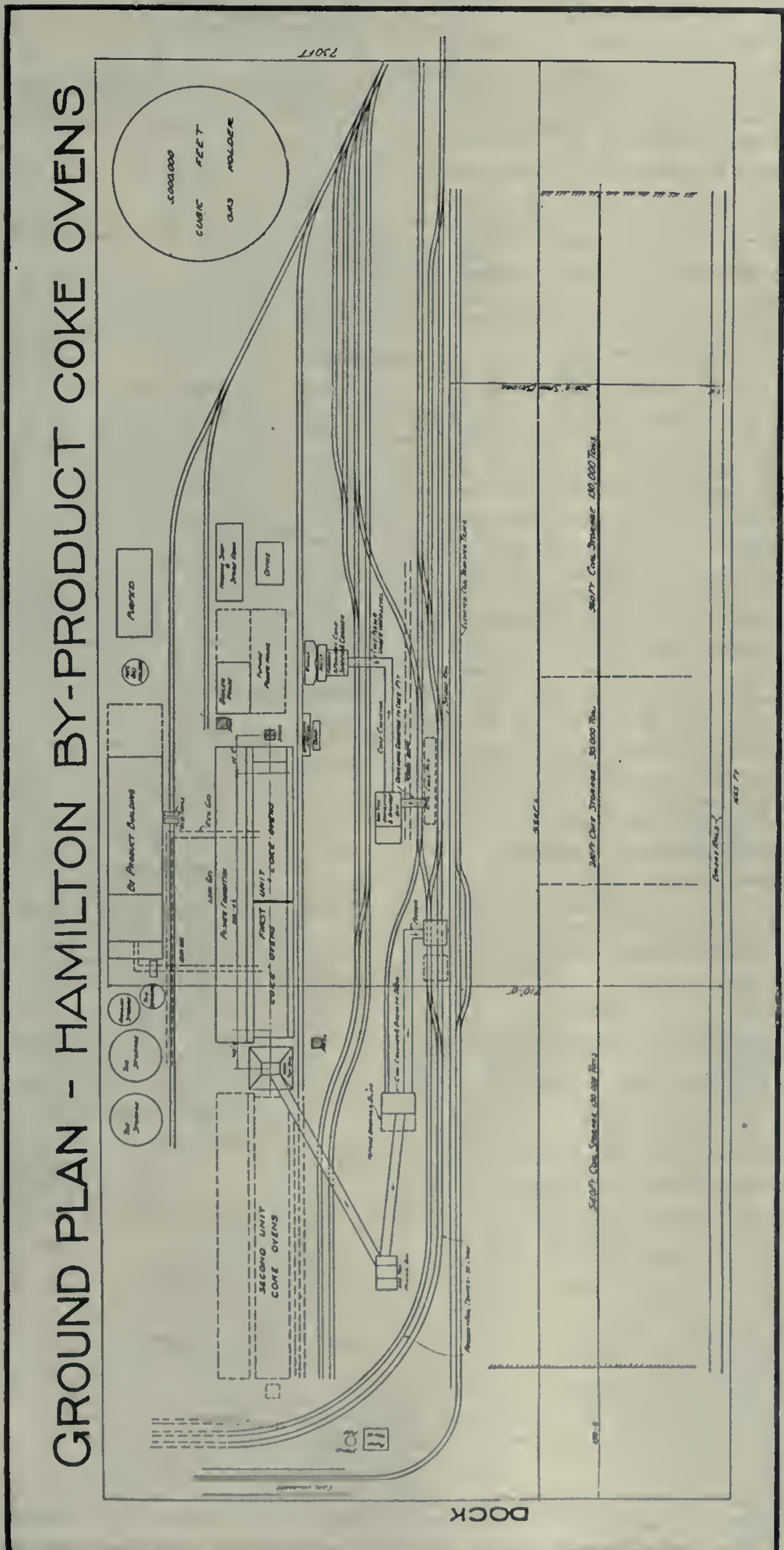
The protectors are made of a low-carbon alloy, practically pure wrought iron. This being ductile, is counted on to eliminate the danger of the protectors being broken by even rough handling. Where very great delicacy in handling is called for, protectors with a babbitt or lead lining are furnished.

HAMILTON GETS $1,000,000 INDUSTRY.

THE Hamilton By-Product Coke Ovens, Limited, capitalized at $1,000,000, has just been incorporated. While considerable local capital will be invested in this enterprise, the majority of the stock will be held by United States capitalists. P. V. Burns, of the Ontario Pipe Line Co., and John G. Gauld, of Nesbit, Gauld & Langs, are two of the local men interested.

The company will manufacture coke for smelting, foundry, minor industrial and domestic uses, and will provide a permanent supply of gas for manufacturing and domestic use. The plant will give employment to about three hundred men, and the allied companies that will be formed to utilize the by-products, tar, ammonia sulphates and benzol, will also employ a large number of men. The initial investment in plant and land will be $1,500,000, and the first unit will consist of 50 ovens, each of 16 tons capacity, operating 18 hours coking time. There will also be erected by-product apparatus for gas separation, coal preparing plant, power compressing and water pumping plant, etc., and a 5,000,000 cubic feet gas holder.

The plant will be electrically equipped and will use between 700 and 1,000 horse-power per day. It will carbonize 1,000 tons of coal per day for 365 days in the year, which will produce about 700 tons of coke per day. The company will keep a six months supply of coking coal, which will be imported from Pennsylvania or West Virginia on hand at all times, thus safeguarding the consumers of gas and coke against the annual shortages caused by railroad blockages and strikes at the mines. This coal will at present be brought in by rail, and on the completion of the new Welland Canal and the Hamilton Harbor improvements will be brought in by water.



LARGE BORING AND TURNING MILL CONTRACT.

A CONTRACT has been placed by the United States Navy Department for a 36 ft. boring and turning mill, for use at the Brooklyn Navy Yard, which will be the largest machine of its kind ever built in the United States, and will be used for machining the tracks for warship turrets. The table of the mill will be driven by a gear which is 28 ft. in diameter, the spindle will be 30 in. in diameter, and the facts of the cross rail and the uprights will measure 4 ft. and 2 ft. respectively. The bed will be 25 ft. wide, the over-all height of the mill will be 27 ft., and the total weight will exceed 600,000 lb. A 75 horse-power motor will be used to drive the machine.

NEW GOVERNMENT STEAMER FOR ST. LAWRENCE SERVICE.

THE Department of Marine and Fisheries has let a contract to the Polson Iron Works of Toronto for the construction of a steamer to be used on the St. Lawrence River above Montreal, and on Lake Ontario, in the lighthouse service. The contract price is $173,399. This is the first ship let under the new condition, namely, that construction must take place in Canada.

EFFICIENCY, ITS USE AND ABUSE.

IN the course of a recent address by Mr. M. W. Mix, president of the Dodge Mfg. Co., Mishawaka, Ind., before the Executive Club, Chicago, on the subject of "Efficiency, Its Use and Abuse," it was pointed out that no efficiency work was ever successful that did not earn for itself the approval and satisfaction of the worker; or, in other words, his spiritual co-operation must be secured. We don't work well under any system if we have the strain of machine methods in our minds, yet in our very capacities as executives we may be endeavoring to press that yoke on those under our supervision without a thought that the same sentiments and feelings that control our disposition to work also exist in the minds of those associated with us.

The Comradeship Feature.

We talk about "mixing." Has it ever occurred to you that the same glad hand and smile and consideration to our fellow-workers may seem more to us and to those receiving them than the same evidence of good fellowship which we may effusively give to a customer, or to some from whom we may expect to benefit through a business transaction? If we seek to influence a business deal with "good mixing," why not go further and give some of it to our associates that we are with every day and who work with us shoulder to shoulder, for better or worse? They want it; they like it. You liked it when you were in their places, and you responded to it or you would not be where you are to-day.

If you worked for a man or firm who didn't give you that cheer and comfort of a certain comradeship, the chances are you quit the job and found a more congenial atmosphere; and under that influence the best that was in you came out, and you delivered the goods you could have delivered to your former employer if he had known how to encourage you. All effort to be effective and gratifying must be collaborative. There may be other routes to success, but they have no sign-posts pointing the way. We may get there, and we may not; in any event, it is not likely to be a pleasure, and we may travel crooked and rough roads when shorter and happier pathways are available.

Value of Sentiment.

I do not mean to be sentimental in this matter. We often find men who are apparently successful who say there is no sentiment in business; to such, I say "bosh." I wouldn't give the snap of my finger for the business or organization that does not contain some sentiment, some vestige of a human soul. No vital problems are finally and satisfactorily disposed of that do not contain some consideration of the human element, and, as for myself, I prefer not to deal with any conditions or form of organizations—social, political, or commercial—in which the dominating influence is actuated by an arterial circulation of ice water. It doesn't get anywhere. Every one who comes in contact with it gets a chill. Other connections are sought at the first opportunity where the broad human spirit does prevail. We can nearly always tell the dominating spirit that pervades an organization on the moment we come in contact with any part of it. In the right sort, everybody radiates enthusiasm, good cheer, courtesy, and consideration. There is no greater asset to any business than occupational good-will, yet it is never seen in a financial statement, and would probably be blue-penciled if it were stated and appraised, because of its intangibility. Nevertheless, it is one of the most important factors in developing a successful business.

Organized Personality.

Corporate or organized personality finds its origin in the executive, and in so far as he recognizes its value as a world or business force, his undertakings will prosper as he capitalizes it in the minds of those of the public with whom his enterprise comes in contact. The unseen, unfelt, intangible thing then becomes the real, active force that makes the wheels go around. No task is severe, no difficulty is unsurmountable, no requirement is too exacting where this spirit really prevails. We cannot buy it, we cannot produce it, except as we cultivate it within ourselves, and expand the usefulness by radiation and encouragement. The human element, therefore, becomes the most important controlling factor in operative standardization, and to just the extent to which it is recognized and developed may be measured the ultimate success of any and all efficiency undertakings.

PREVENTION OF ELECTROLYSIS.

A WRITER on electrolysis says:—Painting or otherwise coating iron with an alkali-resisting metal preservative before embedding it in concrete may serve to minimise the dangers of electrolysis, but no such coating has been found that does not prevent the formation of the bond between the concrete and iron when the concrete sets. All circuits within a building should be kept free from earths directly on a portion of the building itself. If the supply comes from a central station, the local circuits should be periodically disconnected and tested for earths and incipient defects in the insulation.

All pipe lines entering concrete buildings should, if possible, be provided with insulating joints outside the buildings. If a pipe line passes through a building and continues beyond, one or more insulating joints should be placed on both sides of the building. If the potential drop around the insulated section is 8 volts or 10 volts or more, the insulated portion should be shunted by means of a copper cable. The grounding of electric conduits to water pipes and ground plates is in general not to be recommended in the case of concrete structures.

DONT'S FOR MACHINISTS.

DON'T screw on bolts hard enough to strip threads.

Don't leave chips of emery or brass in your eyes over night.

Don't strike highly-tempered steel with a hammer.

Don't work on shafts resting on horses without blocking them.

Don't pour babbitt without wearing goggles.

Don't use your hand to throw off a belt; use a stick.

Don't use a file unless it has a handle.

Don't fail to stand toward the headstock of a lathe when filing.

Don't fail to securely fasten work under a drill before drilling it.

Don't fail to use your "Danger, Do Not Move" sign.

Don't start a job until you have everything ready to finish it.

Don't remove gear covers and other safety appliances and fail to replace them.

Don't try to work and talk to somebody at the same time.

—Safety Engineering.

PATENT REPORT.

THE following Canadian patents were recently secured through the agency of Marion & Marion, patent attorneys, Montreal and Washington, D.C.:

Nos.

150,568—Joseph Wm. Guimont, Montreal, Que.—Water heater.

150,625—Ferdinand Gareau, Montreal, Que.—Smoke consumer and forced draft apparatus.

150,626—John H. Gill, Dunedin, New Zealand—Automatic apparatus for controlling the period of artificial illumination.

150,628—Paul Girod, Ugine (Savoie), France. Process for refining liquid steel.

150,711—Dr. Rudolf Adler, Amsterdam, Holland—Process for manufacturing phosphatid-albumene compounds from fish.

150,712—Dr. Rudolf Adler, Amsterdam, Holland—Process of manufacturing an elastic rubber like material.

150,742—C. Brownlee & J. Morris, Keewatin, Ont—Grain car door.

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Vol. X. OCTOBER 16, 1913 No. 16

PRINCIPAL CONTENTS.

THE MODESTY OF ENGINEERS.

IF there is any class of men who should receive special praise and recognition in the life hereafter it is the foundrymen and proprietors of machine shops. Daily they go about their business exercising care, acting honorably more or less, and outside of their shops, little is known of what these men are doing for humanity. The lawyer and the doctor do their work, and if by chance they should handle an important case, or perform a successful operation, the Press at once admits them to its columns, and gives them praise and notoriety. The engineer, to become the talk of the town, must do something unusual outside of his foundry or shop, like poor Dr. Diesel, of Germany, who disappeared at sea a few weeks ago. Up till that event, although the Diesel engine has become a household word in engineering circles, the man in the street had never heard of it, nor of its inventor.

We have had opportunity of late to observe the modesty of engineers. Having planned a series of biographical sketches of men who have succeeded in the machine business, we approached a number on the matter, and received replies to this effect: that they had done nothing worth being written up in a paper, and would wait until age crept a little farther before deciding to "rush into print." We wish to remind these men that this is a rare opportunity for them to give a helping hand to ambitious machinists striving to climb the ladder of success. What more inspiring reading is there than the biography? In the eyes of the man who runs a foundry or machine shop he himself may be a nonentity, who has achieved nothing beyond building up an engineering business. We quite realize that, and the workmen in Canadian foundries and machine shops wish to know how they managed it. By looking into the matter carefully, it will be seen that the quality of work put out by workmen will be better as a result of reading such biographies. How can a man help but do better work when he reads in Canadian Machinery that his employer started in life carrying drinking water, and that it was by observation and industry that he attained his present position?

The suggestion has been made that this series of sketches should be confined to men who are at the heads of big industries like the Steel Company of Canada, the Canadian Westinghouse Co., etc. While efforts have been made to give the secrets of success of eminent Canadian engineers, we believe there is as much romance and inspiration in the life stories of men who have built up small yet substantial foundry and machine shop businesses. We met a man the other day who is operating a moderately sized shop who, a few years ago, was a farmer, yet in a remarkable manner, launched out in the structural steel business, and is to-day well known all over Canada through the success of his products.

We wish that captains of industry would take this opportunity of telling our readers how they achieved their first or their greatest success. We were told last week how the head of one of the largest engineering concerns obtained a start. He was soliciting advertisements for a newspaper, and on his rounds opportunity presented itself. He grasped it. To-day he is a great financier. The details of the case read more like fiction than fact.

PATRIOTISM VS. PROFIT.

HOW many manufacturers are there in Canada who put their country before profit? In other words, are there men in Canada who would prefer to lose a little money on a deal rather than buy outside of the Canadian market? The situation must present itself to manufacturers every day. There is one man handling American goods in Ontario who makes it a rule never to cut his prices when competing with Canadian makers, but let a foreign competitor come on the scene, and he will have the business by hook or crook. Patriotism comes first with him in this matter.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

	Mont'l.	Tor'to.
Grey Forge, Pittsburg.	.....	14.40
Lake Superior, charcoal, Chicago	.....	15 25
Middlesboro, No. 3	20 00	21 50
Carron, special	22 50	.....
Carron, soft	22 50	.....
Cleveland, No. 3	20 00	22 00
Clarence, No. 3	20 00	21 00
Jarrow	.....	23 50
Glengarnock	.....	26 00
Michigan charcoal iron	27 00	.....
Ferro Nickel pig iron (Soo)	.....	25 00
Foundry No. 1, Port Colborne	.....	$17 00
Foundry No. 2, Port Colborne	.....	16.50
Canadian Foundry No. 1	$18 15	.....
Canadian Foundry No. 2	18 65	.....

BILLETS.

	Per Gross Ton.
Bessemer billets, Pittsburgh	$23 50
Open hearth billets, Pittsburgh.	23 00
Forging billets, Pittsburgh	29 00
Wire rods, Pittsburgh	26 50

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto	2.10
Steel bars, f.o.b., Toronto	2.15
Common bar iron, f.o.b., Montreal.	2.15
Steel bars, f.o.b., Montreal	2.25
Bessemer rails, heavy, at mill	1.25
Steel bars, Pittsburgh, future	1.40
Tank plates, Pittsburgh, future	1.40
Beams, Pittsburgh, future	1.40
Angles, Pittsburgh, future	1.40
Steel hoops, Pittsburgh	1.60
F.O.B., Toronto Warehouse.	**Cents.**
Steel bars	2.30
Small shapes	2.40
Warehouse, Freight and Duty to Pay.	**Cents.**
Steel bars	1.80
Structural shapes	1.90
Plates	1.90

Freight, Pittsburgh to Toronto.

18 cents carload; 21 cents less carload.

IRON PIPE FITTINGS.

Canadian malleable, 40 per cent.; cast iron, 65; standard bushings, 70; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 75; malleable, lipped unions, 65.

NAILS AND SPIKES.

Standard steel wire nails, base	$2 35	
Cut nails	$2 60	2 65
Miscellaneous wire nails	75 per cent.	
Pressed-spikes, ⅝ diam., 100 lbs.	2 85	

BOILER PLATES.

	Mont'l.	Tor'to.
Plates, ¼ to ½ in., 100 lbs.	$2.35	$2.30
Heads, per 100 lbs.	2.65	2.65
Tank plates, 3-16 in.	2.60	2.55
Tubes, per 100 ft., 1 inch	9.50	8.50
" " 1¼ in.	9.50	8.50
" " 1½ "	9.50	9.00
" " 1¾ "	9.50	9.00
" " 2 "	8.75	8.75
" " 2½ "	11.15	11.50
" " 3 "	12.10	12.00
" " 3½ "	14.15	14.50
" " 4 "	18.00	18.00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Stove bolts	80 & 7½
Machine bolts, ⅜ and less	65 & 5
Machine bolts, 7-16	57½
Blank bolts	57½
Bolt ends	57½
Machine screws, iron, brass	35 p c.
Nuts, square, all sizes	4c per lb off
Nuts, Hexagon, all sizes	4¼ per lb off
Fillister head	25 per cent.
Iron rivets	60, 10 p c off
Wood screws, flathead, bright	85, 10, 7½ p c off
Wood screws, flathead, brass	75, 10, 7½ p c off
Wood screws, flathead bronze	70, 10, 7½ p c off

National-Acme "Milled Products."

Sq. & Hex Head Cap Screws	65 & 10%
Sq. & Hex Head Cay Screws	65 & 10%
Rd. & Fil. Head Cap Screws	45-10-10%
Flat & But. Head Cap Screws	40-10-10%
Finished Nuts up to 1 in.	75%
Finished Nuts over 1 in.	72%
Semi-Fin. Nuts, up to 1 in.	75%
Semi-Fin. Nuts over 1 in.	72%
Studs	65%

Discounts f.o.b., Montreal.

OLD MATERIAL.

Dealers' Buying Prices.	Mont'l.	Tor'to.
Copper, light	$10 50	$11 50
Copper, crucible	14 00	14 50
Copper, uncr'bled, heavy	13 00	12 50
Copper wire, uncre'bled	12 50	12 50
No. 1 machine compos'n.	11 00	12 50
No. 1 comps'n turnings	9 50	9 50
No. 1 wrought iron	10 00	9 00
Heavy melting steel	8 50	10 00
No. 1 machinery cast iron	13 00	14 00
New brass clippings	8 50	9 00
No. 1 brass turnings	7 25	8 00
Heavy lead	3 75	4 25
Tea lead	3 00	3 20
Scrap zinc	3 00	3 50

WROUGHT IRON PIPE.

The following are Toronto jobbers' discounts on pipe in effect from April 21, 1913:

	Buttweld		Lapweld	
Standard	Black	Gal.	Black	Gal.
¼ ⅜ in.	62	47	....	....
½ in.	68	58	....	....
¾ to 1½	71½	61½	68½	58½
2 in.	71½	61½	68½	58½
2½ to 4 in.	71½	61½	70½	60½
4½ to 6 in.	....	....	71½	61½
7, 8, 10 in.	....	....	66	54
X Strong P. E.				
¼, ⅜, ½in.	56½	46½	....	....
¾ to 1½ in.	67½	57½	....	....
2 to 3 in.	68½	58½	....	....
2½ to 4 in.	....	....	65	55
4½ to 6 in.	....	....	64	56
7 to 8 in.	....	....	55	45
XX Strong P. E.				
½ to 2 in.	43	33	....	....
2½ to 4 in.	....	....	43	33

PRICES OF WROUGHT IRON PIPE.

Standard.		Extra Strong.		D. Ex. Strong.	
Nom. Diam.	Price. per ft.	Sizes Ins.	Price per ft.	Size Ins.	Price per ft.
⅛in	$ .05½	⅛in	$ .12	½	$ .32
¼in	.06	¼in	.07½	¾	.35
⅜in	.06	⅜in	.07½	1	.37
½in	.08½	½in	.11	1¼	.52½
¾in	.11½	¾in	.15	1½	.65
1 in	.17½	1 in	.22	2	.91
1¼in	.23½	1¼in	.30	2½	1.37
1½in	.27½	1½in	.36½	3	1.86
2 in	.37	2 in	.50½	3½	2.30
2½in	.58½	2½in	.77	4	2.76
3 in	.76½	3 in	1.03	4½	3.26
3½in	.92	3½in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4½in	1.27	4½in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.86	...	.....
7 in	2.38	7 in	3.81	...	.....
8 in	2.50	8 in	4.34	...	.....
8 in	2.88	9 in	4.90	...	.....
9 in	3.45	10 in	5.48	...	.....
10 in	3.20	....	....	...	.....
10 in	3.50	....	....	...	.....
10 in	4.12	....	....	...	.....

METALS.

	Mont'l.	Tor'to.
Lake copper	$17.00	$16.25
Electrolytic copper	17.00	16.25
Casting copper	17.00	16.00
Spelter	5.40	5.75
Tin	42.00	43.00
Lead	5.35	5.00
Antimony	8.50	9.00
Aluminum	22.00	18.00

SHEETS.

	Mont'l.	Tor'to.
Sheets, black, No. 28	$2.85	2.90
Canada plates, ordinary, 52 sheets	2 90	3 00
Canada plates, all bright.	4 00	4 15
Apollo brand, 10¾ oz. (American)	4 30	4 20
Queen's Head, 28 B.W.G.	4 40	4 40
Fleur-de-Lis, 28 B.W.G..	4 20	4 25
Gorbal's Best Best, No. 28	4 40	4 40
Viking metal, No. 28....	4 40	4 40

MISCELLANEOUS.

	Cents
Putty, 100 lb drums	$2.70
Red dry lead, 5 cwt. casks, per cwt.	6.00
Glue, French medal, per lb	0.10
Tarred slaters' paper, per roll...	0.95
Motor gasoline, single bbls., gal..	0.26
Benzine, per gal.	23½
Pure turpentine	0.60
Linseed oil, raw	0.60
Linseed oil, boiled	0.63
Plaster of Paris, per bbl.	2.10
Plumbers' Oakum, per 100 lbs....	3.25
Pure Manila rope	17

COKE AND COAL.

Solvay Foundry Coke	$5.95
Connellsville Foundry Coke	5.80
Yough, Steam Lump Coal	3.88
Penn. Steam Lump Coal	3.68
Best Slack	2.99

All net ton f.o.b. Toronto.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents.

Montreal, October 13, 1913.—There is little to report to-day. Conditions remain practically unchanged from last week, though the machinery business has perhaps been rather brisker. The contracts for the equipment of the machine shop of the Atlantic Sugar Refineries, Ltd., have not yet been let, this matter having hung fire for some considerable time now. Williams & Wilson have sold some wood-working machinery to the C.P.R., and Mussens, Ltd., have secured large orders for excavators, steam shovels, etc., from the contractors for the new Welland canal.

The Canadian Vickers Co. have been kept busily engaged all week on the C.P.R. steamship "Mount Temple" which entered their dry dock on the 5th instant, after running aground off Longueuil. This firm have been rapidly perfecting their organization during the past six months and confidently expect to have their shipbuilding slip, engineering and boiler shops, etc., fully completed during the summer of 1914.

Pig Iron, Etc.

The demand from all quarters for pig continues unabated. A. C. Leslie & Co. report several good orders for English pig, and business is likely to keep good right up to the close of navigation. Prices remain practically unchanged from last week, though the figures quoted may be shaded for large quantities.

Copper is a trifle easier than last week, but this market continues dull. Unless the world demand for copper, however, shows a marked decline in the immediate future, a further considerable advance in the price seems unavoidable, since the world's visible supplies on hand at present amount to only 92,000,000 pounds, which is by far the lowest point reached during the last five years.

Toronto, Ont., Oct. 13, 1913.—The general steel and iron market is solid. There has been no agreement between the different makers in their selling prices, and as a result, mill prices of steel, both here and in the States, remain the same. Orders for small tonnage are being secured at current prices without difficulty, and large firms are being given big reductions when placing their orders several months ahead. Manufacturers have been holding off so long, hoping the price of steel would drop appreciably, that they are now compelled to buy, and local mills are feeling the effects. Of late, there has been an increased demand for reinforcing steel, contractors having decided to rush things owing to the approach of cold weather. No Toronto dealers report feeling the effect of the new American tariff bill beyond an uncertainty among their customers as to the way prices will go. In the event of foreign competition becoming severe, dealers in steel are inclined to protect their customers who place orders at current prices.

Machine Tools.

The feature of this week's market is an order placed by Ford's, the automobile makers, for over $100,000 worth of equipment for their shops in Walkerville, Ont. Up to the present, the transmissions for Ford cars have been made by another concern in Detroit, and in order to commence the manufacture of these themselves, this order has been placed. An order for about a million dollars' worth of machine tools is at present being awarded by Ford's for their plant in Detroit for the same reason. The Canadian order was distributed over a number of firms; The A. R. Williams Co., The Canadian Fairbanks-Morse Co., and H. W. Petrie, Ltd., Toronto, being among those favored. A good part of the order went to American firms who have no agencies in Canada and considerable cutting in prices took place. The tools supplied include lathes, grinders, drills, hobbing machines, presses, etc. It is reported that the new Forge Company who will start business in Chatham, Ont., will do much of the work for Ford's in connection with the manufacture of transmissions. Details concerning the plant to be erected will be found in our Industrial News' Section.

A new firm recently arrived in the Canadian market is the Diamond Manufacturing Co., of Detroit, who have purchased space in the industrial building recently erected in Walkerville, and will make stampings.

Metals.

The metal business was reported to have reached a critical position to-day. The market weakened considerably on Friday. Copper and tin are most affected. Prices, however, remain to-day much as they were last week. Business in copper wire is at a standstill, transmission people refusing to buy at 20 cents a pound.

EFFECT OF AMERICAN TARIFF.

SIR LYMAN JONES, President of the Massey-Harris Co., in an interview at Saskatoon, which city he visited recently, expressed the opinion that the provisions of the Underwood tariff bill permitting the entry of farm machinery free into the United States would have practically no effect on Canadian manufactures, and said that the American companies were so firmly established they feared no competition. Asked as to the effect if Canada were to place farm implements on the free list, he said the American plant of the Massey-Harris Co. might do a little more business.

Speaking in a general way, he said that the subject opened up the whole question of free trade, and propounded the question whether the people were prepared for direct taxation. Money, he said, seemed scarce in the West, and more than one good crop was needed to liquidate the existing indebtedness of the farmers.

STREET CAR LINE INNOVATION.

A COMPANY has just been organized in New York city to operate an entirely new kind of street car line at Great Neck, L.I. Although the cars will run on rails and will have every appearance of ordinary electric cars, they will be independent units operating without overhead wires, third rails, or central power station. The source of power is a steam turbine supplied with steam from a flash boiler, the turbine operating a hydraulic speed transmission and two oil motors connected with the two axles.

The flash boiler is situated on one side of one platform and is heated by means of either kerosene or oil gas. The turbine is placed under the body of the car. It runs at a normal speed of from 3,000 to 4,000 revolutions per minute, and is geared by means of a herring-bone gear set to the hydraulic transmission gear which runs at about 600 revolutions per minute. The car is of the single-truck type, having only four wheels, and all four of these are used for driving. Power is transmitted from the oil pump to the two axles through the two oil motors. The turbine will develop over 25 brake horse-power.

NEW SYSTEM OF ELECTRIC TRACTION.

IT is reported that a new system of electric traction will be put into operation on the Norfolk and Western Railway, West Virginia, next January. Current will be supplied to the locomotives at 11,000 volts, 25 cycles, and a combination transformer and a rotating induction machine on each locomotive will convert this to 2-phase 750 volts for the motors, which will be of the normal synchronous polyphase type without commutators. There will be four motors on each locomotive, with a total continuous rating of 1,300 horse-power at fourteen miles per hour. Each motor will have windings for producing either four or eight poles, giving two synchronous speeds of twenty-eight and fourteen miles per hour respectively. The wound rotors will give, further, a synchronous speed of seven miles per hour, with cascade connection, and allow of resistance being inserted for starting and for intermediate speeds.

Two of these 130-ton locomotives will be used for each train of 3,250 tons weight. These trains carry principally coal from the Pocahontas coal-field. The motors will be geared in pairs through a jack shaft crank and excentrics to the driving wheels, the gear ratio being 18 to 85, and the driving-wheels 62 in. in diameter. The contract provides for twenty-six such locomotives, together with track equipment, transformer, sub-stations and a 27,000 kilowatt generating plant. These polyphase motors were chosen as against single-phase commutators on account of space limitations and lower cost, and the possibility of regenerative and safer braking on the heavy down gradients.

TERMINAL PLANS AT VANCOUVER.

OFFICIALS of the Great Northern and Canadian Northern Railways were in conference quite recently, discussing the question of a union depot. No definite decision has been issued as yet. According to the city's agreement with the C.N.R., that railway was bound to build a station to cost $1,000,000. The present station of the C.N.R. on the north side of the creek is entirely inadequate for the needs of a transcontinental railway.

The Pacific Great Eastern are working on their line to Fort George, and while their terminals are at North Vancouver, it is quite probable that freight and passenger facilities will be established in Vancouver on completion of the bridge over the second narrows of Burrard Inlet, which project has just been put up to the Provincial Government as a public undertaking. From Fort George to Vancouver, the Grand Trunk Pacific will possibly obtain running rights over the P.G.E.

On the strength of a statement by Hugh Sutherland, executive agent of the C.N.R. in Winnipeg, that wherever possible in Western Canada the C.N.R. and G.T.P. were planning to erect union stations, it is quite within reason to believe that a great union station will be erected in False Creek to be used by all four roads above mentioned.

ELECTRICAL LABORATORY AND STOREHOUSE.

A GOVERNMENT-OWNED electrical laboratory and storehouse, to be used exclusively for testing and supplying material to municipal customers, has been erected on Strachan avenue, Toronto, and is now placed at the disposal of the various municipalities throughout the Province of Ontario by the Ontario Hydro-electric Commission.

The Building Feature.

The building consists of three stories and a basement, and is 110 feet long by 70 feet wide. Approximately one-third of the area is to be devoted to laboratory work, the remainder as a storehouse for the large quantities of cable, line hardware, lamps and other incidental municipal supplies. The laboratory section is subdivided into the following four departments; high tensions and general testing, standards and meters, lamps and illuminating engineering, and laboratory workshops. A wide variety of tests is conducted in the first-named department, which cover the testing of material used in the construction of both high and low tension lines.

Equipment Features.

Every necessary kind of testing machine has been installed. This includes a 300,000-volt test transformer of large capacity, especially designed to meet conditions similar to those experienced by insulators in active service. Transformer oil is also tested to insure the use of proper quality in the general transformer system. For this purpose an additional test transformer has been installed with a maximum potential of 75,000 volts. Tests, conformable with those already required by the Commission, will be carried out.

In connection with the oil-testing system, the Commission states that switch and transformer oil filters have been installed at all 110,000-volt sub-stations on the Niagara system, which can filter oil for any municipality at cost, but the municipality before shipping the oil must advise the Commission.

Standards and Meter Dept.

On the first floor of the laboratory, above the general testing rooms, is located the standards and meter department. A complete Watt-hour meter testing equipment, as well as a Blondell oscillograph, for detecting abnormal line conditions, are to be found in this department. Adjacent to the meter department is the lamp and illuminating engineering section. The Commission lays great stress on the importance that all municipalities obtain the maximum value for their consumers' lighting equipment, and every conceivable appliance obtainable is to be seen here. This places the Commission in a position to determine accurately and fairly the relative values of the different makes of incandescent lamps or other types of light sources for use.

It has been the practice of the Commission to make periodic purchases of samples of lamps in the open market. These lamps are measured for initial rating, and are subsequently tested for life performance under identical conditions, which has given the Commission a knowledge of cost per candle-power of each lamp of every make tested. A large quantity of lamps are always kept in stock by the Commission, which will be supplied at cost to municipalities using Hydro-electric power, as will be the case with all material consigned to municipalities by the Commission.

WANTS $15,000 DAMAGES.

ALLEGING wrongful dismissal, Wm. A Grocock, engineer, formerly the representative in Ontario of Edgar Allen & Co., Ltd., is suing his late employers for $15,000 damages in the Non-Jury Assize Court at Toronto. The defendant firm are tool steel and castings manufacturers, with headquarters in Sheffield, England. Plaintiff was employed by them in September, 1910, to take charge of the business in Ontario, and to work under instructions from the chief agent in Montreal. His remuneration was £1,000 per year and two and one-half per cent. commission on the turnover. The defendants had paid him a year's salary in lieu of notice. His averments include misrepresentation on the part of defendants as to the volume of business being done in Ontario prior to his connection with the firm. They told him they had a turnover of $6,000 a month.

Plaintiff testifies that he left a salary of £820 a year to join the defendant firm. He was then with the Wm. Jessop & Sons, Ltd., in Burmah, India, and was handling the same goods for which defendants wanted a man in Ontario.

ENGINEERS' TRIBUTE TO LATE JAMES ROSS.

THE executive of the Brotherhood of Locomotive Engineers, Atlantic Division, No. 581, has sent to Mr. J. K. L. Ross expressing regret at the death of Mr. James Ross, and appreciation of the course of the deceased in connection with the miners' strike some years ago. Following is a copy of the letter:

"To Mr. J. K. L. Ross:

"Dear Sir,—The engineers on the S. and L. were much surprised and deeply grieved when they heard that your father had passed away. Our deepest sympathy goes out to you in your sad bereavement. We all feel that we have lost a good and true friend. No other man we have worked for gave our men the feeling of security in their positions that he did. We always were satisfied that if we did what was right no other influence could hurt us or our families. When some of us were unfortunate enough to err in judgment and our error cost the Company quite a lot, in the usual course on railways the officials had nothing to do but severely discipline us. Your father used his own position not to discipline our men, but to give them a good man's advice, which has helped our men and also the Company which he then presided over. Acts like these are never forgotten by railway men, and there were many sincere expressions of sorrow heard when the news of his death flashed over our road.

"They have also instructed us to convey to your sorrowing mother our deepest sympathy to her in her trying hour.

"On behalf of the S. and L. Engineers, we are, sincerely yours, (Signed). D. W. Macdonald, chairman; Parker Holmes, sec.-treas.; Hugh MacPherson, chief engineer.

"Glace Bay, Cape Breton, Canada, Sept. 20, 1913."

PORT OF MONTREAL REVENUE.

THE customs returns for the month of September, show a decrease of $84,473.60, as compared with September 1912, the receipts for the past month being $2,133,696.61 as against $2,218,170.21 for the corresponding month of last year. Customs showed a decrease during August of over $49,000, the first decrease to be recorded for the season. The September decrease would have been much worse but for the heavy payments made on the last day of the month. They amounted to considerably over $100,000.

Curiously enough, while the customs returns showed such a marked decrease the inland revenue returns for the district of Montreal showed a still greater increase, the surplus received over September last year amounting to $96,605.57. The receipts for the past month, which will be supplemented by some further small amounts from Valleyfield and elsewhere, amounted to $925,029.83, as compared with $828,424.26 for September 1912. During August the inland revenue returns decreased by nearly $38,000, so the increase for September is the more remarkable.

RAIL MANUFACTURE.

DURING the first half of this year, orders amounting to about 120,000 tons were booked in the Belgian rail industry, including 65,000 tons for South America, 25,000 tons for Holland and Dutch Colonies, 5,000 tons for Sweden, 2,000 tons for China, 13,000 tons for Norway, and about 10,000 tons for Portugal and Colonies. Some countries, such as Brazil, the Argentine, and other South American Republics, are at present on the market for large supplies of rails, but as the orders must be executed within a relatively short time, the Belgian steel works find it rather difficult to accept them because they are engaged in the manufacture of 120,000 tons of rails for the Belgian railways.

The figures for the first seven months of this year show a total of 94,353 tons of rails exported, against 100,064 tons in 1912, a decrease of 5,711 tons, the principal markets being Brazil with 22,083 tons, Holland with 17,492 tons, Norway with 7,057 tons, Spain with 5,915 tons, Egypt with 5,365 tons, and England with 3,319 tons, against 611 tons in 1912.

MONTREAL DRYDOCK TARIFF.

APPROVAL has been given by the Governor-General-in-Council of the following tariff of tolls, submitted by the Canadian Vickers, Ltd., in connection with their shipdock, the "Duke of Connaught," at Montreal; such approval being subject to the condition that the regulations may be amended at any time, should the Minister of Public Works consider it necessary to do so, and that the tariff may be likewise amended should it be established, to his satisfaction, that the rates levied are excessive:

Gross Reg. Tons.	1st day.	Following days.
Up to 1,000....	$300.00	$ 80.00
1,000– 1,199....	340.00	95.00
1,200– 1,399....	365.00	95.00
1,400– 1,500....	390.00	95.00
1,600– 1,799....	415.00	110.00
1,800– 1,999....	450.00	110.00
2,000– 2,249....	475.00	110.00
2,250– 2,499....	500.00	125.00
2,500– 2,749....	525.00	125.00
2,750– 2,999....	550.00	125.00
3,000– 3499....	575.00	150.00
3,500– 3,999....	600.00	150.00
4,000– 4,499....	625.00	150.00
4,500– 4,999....	650.00	175.00
5,000– 5,499....	700.00	175.00
5,500– 5,999....	750.00	200.00
6,000– 6,749....	875.00	200.00
6,750– 7,499....	950.00	225.00
7,500– 8,249....	1,025.00	225.00
8,250– 8,999....	1,100.00	250.00
9,000– 9,999....	1,200.00	275.00
10,000–10,999....	1,300.00	300.00
11,000–11,999....	1,400.00	350.00
12,000–12,999....	1,500.00	400.00
13,000–13,999....	1,600.00	450.00
14,000–14,999....	1,700.00	500.00
15,000–15,999....	1,800.00	550.00
16,000–16,999....	1,950.00	600.00
17,000–17,999....	2,050.00	650.00
18,000–18,999....	2,150.00	700.00
19,000–19,999....	2,250.00	750.00
20,000–20,999....	2,350.00	850.00
21,000–21,999....	2,450.00	950.00
22,000–22,999....	2,550.00	1,050.00
23,000–23,999....	2,650.00	1,150.00
24,000–25,000....	2,750.00	1,250.00

The Siemens Co., of Canada report a further order received by their head office in connection with the Government electrification of the suburban railways of Melbourne, Australia, consisting of 11-2,000 K.W. rotary converter sets complete, with transformers, rheostats, diverters, starting gear, etc., and bringing the total number of rotary converters in connection with this project up to the following:—25 Rotary converters, 2,000 K.W. each; 10 Rotary converters, 1,000 K.W. each; 4 Rotary converters, 500 K.W. each.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Engineering

Sarnia, Ont.— The Perfection Stove Co. have commenced the erection of their main factory, measuring 300 x 200 feet.

Lethbridge, Alta.— The Richardson Scale Co., Passaic, N.J., will locate a factory here.

Toronto, Ont.—A machine shop to cost $10,000 will be built by the Toronto Railway Co.

The John Deere Plow Co., of Saskatoon, Sask., has been registered in Saskatchewan to do business.

The Canadian Faced Brick Process and Machinery Co., Ltd., has been incorporated at Regina, Sask., with $100,000 capital, and head office at Moose Jaw.

Midland, Ont.—The citizens have voted in favor of bonusing a malleable iron plant to be built by Edward John Vanderboom, of Milwaukee, Wis.

Anyox, B.C. — The 2,000-ton smelter being constructed by The Granby Co. will be ready by Jan. 1. There has been some delay in getting supplies of steel.

Berlin, Ont.—Ground has been broken for the new plant of the Canadian Buffalo Forge Co. The building will be 116x210 ft., with two high bays fitted with electric traveling cranes.

Montreal, Que.—The Montreal Autobus Co., Montreal, Que., will have plans prepared for the construction of a garage. Ross & MacDonald, 1 Belmont St., Montreal, are the architects.

Wallaceburg, Ont.—The Wallaceburg Brass Mfg. Co., Ltd., Wallaceburg, are making an addition to their foundry, costing $5,000, and expect to make a further addition next year. They manufacture valves.

Orillia, Ont.—Following out their policy of concentrating their manufacturing business, the Tudhope-Anderson Co. have decided to move their stove manufacturing plant from Smith's Falls to Orillia during the next two weeks.

Port Arthur, Ont.—The C.N.R. will build a modern car repairing plant in connection with local terminals next summer, at a cost of $30,000. The company has ordered three snow plows from the Canadian Car and Foundry Co. and two locomotives.

Port Arthur, Ont.—The Port Arthur Wagon Works will erect an addition to their plant, for which plans have been prepared. It will consist of a foundry and machine shop for making certain hardware used on the "New Deal" wagon. About $5,000 will be spent.

Chatham, Ont.—The National Forging Co. have taken over the plant known as the Defiance Iron Works and latterly as the Swift Motor Car Co. The new company is capitalized at $100,000, and will make auto and carriage forgings, and sockets.

Edmonton, Alta.—It is announced that J. D. McArthur will move his shops from Transcona to Edmonton immediately, together with all machinery and equipment, it being his intention to do all work in connection with the Edmonton, Dunvegan and British Columbia Railway in this city.

Toronto, Ont.—Fire which broke out last Thursday afternoon in the one-storey frame dwelling at 209 First Ave., owned and used by J. J. Heffron as a machine shop, caused damage to the extent of nearly $800, half of which was done to the machinery in the building.

Toronto, Ont.—The Canada Wire & Cable Co., Toronto, are building a factory 3 storeys, 100x200, at Leaside, Ont.

Hamilton, Ont.—The Canadian Westinghouse Co., Ltd., are building a foundry costing $125,000. Architects, Prack & Perrine, Hamilton.

Regina, Sask.— T. Alfred McAuley, president and general manager of the Canadian Equipment and Supply Co., Ltd., Calgary and Edmonton, will build a warehouse in Regina next spring. The firm handles municipal supplies, steel pipes, hoisting and carrying machinery, cables and heavy hardware.

Medicine Hat, Alta.—The Saskatchewan Bridge & Iron Co., capitalized at $500,000, has started work on the foundation of a new factory here, costing about $150,000. The company will make structural steel for general bridge and construction work. George Harrison, manager.

St. Catharines.—The Lord & Burnham Co., with factories in Irvington on the Hudson, and Desplaines, Ill., will establish a Canadian branch in this city for the manufacture of steel green houses, including frames and boilers, according to a bylaw which went before the city council on Oct. 6, and which will be voted upon by the ratepayers on Oct. 30. The company will pay $10,000 for a site of 16 acres, establish a plant to cost $75,000, and employ at least 100 hands. A fixed assessment of $10,000 for ten years will be granted.

Electrical

Fergus, Ont.—The village will spend $16,000 on an electric lighting plant, if the Hydro-Electric by-law passes. James Beattie, clerk.

St. Catharines, Ont.—The council has decided to submit a hydro by-law to the people on Oct. 30. The sum of $116,000 as an expenditure for plant and distributing is mentioned in the by-law.

Windsor Mills, Que.—The town is considering the development of three or four hundred horse power in this district.

Smithers, B.C.—J. L. Hamilton and J. Fraser are building an electric lighting and water works plant.

Toronto, Ont.—Experts engaged to value the Toronto Street Railway and the Toronto Electric Light systems report the former worth $20,608,035 and the latter $6,132,754. The owners ask the city to pay $22,000,000 and $8,000,000 for them respectively.

Regina, Sask.—A. S. Porter, who is interested in a scheme to supply Regina with power, recently offered it to the city council at 7-10 per cent. per k.w.h., provided they took a certain amount for ten years. The plant will be erected near Estevan, with a capacity of 10,000 h.p.

General Industrial

Montreal, Que.—The Renchard-Elms Shirt & Tie Co., will erect a factory, and are preparing plans.

Windsor Mills, Que.—Plans have been completed for the construction of a bag factory here.

Toronto, Ont.—R. Crean & Co. are building a hat factory to cost $40,000, four storeys, 50x132 ft.

Hamilton, Ont.—The Board of Works has passed plans for a system of overflow sewers costing $650,000.

St. Catharines, Ont.—The Rice Hubert Shoe Co., Courtland, N.Y., are building a factory costing $10,000. Architect, Jos. Daw, 165 St. Paul St.

Victoria, B.C.—The British Columbia Pottery Co. are building a plant to cost $100,000. General Manager, A. T. Monteith.

Stratford, Ont. — The Avon Hoisery Co.'s plant will be trebled in size, and a new factory building 95 x 60 feet, four storeys high will be erected.

Chamcook, N.B.—The Canadian Sardine Co. have re-opened their plant, and will engage 100 hands.

Saskatoon, Sask.—Stewart Tilton and Charles F. Tease have begun a soap factory at No. 112 Avenue South, for which machinery has been purchased from Kansas City.

Port Hawkesbury, N.S.—Good progress is being made on the new cold storage buildings for the Atlantic Fisheries, Ltd., to replace those destroyed by fire some months ago.

Montreal, Que. — The United States Shoe Machinery Co. have taken out a building permit to erect a $300,000 building adjoining their present factory in Maisonneuve.

Sarnia, Ont.—The Canadian branch of Larned Carter & Co., Detroit, overall makers, have ordered 24 new machines, and a new factory will be built at an early date.

Saskatoon, Sask.—From Bavaria an inquiry has been sent to the board of trade for information regarding prospects of establishing a flax industry in Saskatoon. Twenty bales of flax straw are being sent for sample purposes.

Maisonneuve, Que.—The council are undecided regarding the application from the Boston Mechanical Co., who wish to manufacture a special chemical product used in the making of shoes; this on the ground that the process is alleged to be dangerous.

Winnipeg, Man.—An entirely new industry, supplied from the only deposit of its kind in the Western Provinces between Gypsumville, Man., and the coast, north of the Athabasca River, Alberta, is being promoted, and it is intended to capitalize the new company, in which A. J. Norquay and R. McLennan are the Winnipeg representatives at $500,000.

Sarnia, Ont.—The new oil pipe line between the Imperial Oil Works in this city and the Lima oil fields in Ohio has been completed. The line is 154 miles long, and constructed of six-inch pipe. The pumps have been started at the oil fields, but it is estimated it will require five days for the first oil to fill the pipes and reach Sarnia.

Winnipeg, Man.—The Board of Control is in the market for gas testing equipment. M. Peterson, secretary.

Winnipeg, Man.—Tenders will be invited early in the year 1914 for the construction of works necessary for the delivery of water from Shoal Lake to the Greater Winnipeg Water District. The following is a brief description of the proposed works:

1. A dyke and channel for the diversion of the Falcon river into Snowshoe Bay. 2. 85 miles concrete aqueduct. 3. 10 miles pipe line (probably 1916 work). 4. 900 lin. ft. tunnel under Red river. 5. 85 miles of construction railway. 6. Telephone line. 7. Clearing and ditching. Contractors having a view to tendering on the work should send their inspectors over the line at as early a date as possible. M. Peterson, Acting Secretary of the Administration Board, Greater Winnipeg Water District.

Halifax, N.S.—The tin press which is to be placed and worked on the incinerator plant arrived a fortnight ago, from Germany, and John Simon who imported it, is now awaiting the building of a shed by the City, to place the machinery on the plant. Some time ago, the city entered into an agreement with Mr. Simon to permit him to instal the press on the incinerator site and promised that he could use the tins, etc., culled from the city garbage.

Wood-Working

Robertson, Que.—Geo. Rousseau intends rebuilding his saw mill immediately.

Wyoming, Ont.—A by-law to grant a bonus to D. Senecal to assist him in erecting and operating a box and basket factory in this village was carried last week.

Port Hammond, B.C.—The Port Hammond Mill Co. [illegible] resume the operation of their timber mill on a larger scale in a few months. It is believed to have been sold.

Marine

Charlottetown, P.E.I.—The Maritime Telegraph & Telephone Co., Ltd., will build a street railway here.

Vancouver, B.C.—The Burrard Inlet Tunnel and Bridge Co. have decided at once to construct the bridge over Second Narrows if the Provincial Government will not take over the scheme.

Collingwood, Ont.—The second of the two dredges now under construction in the yards of the Collingwood Ship Building Co. for the Dominion Government was launched Oct. 6.

Collingwood, Ont.—It is understood that the Collingwood Shipbuilding Co. will in the near future secure a contract to build a steamer as large as the James Carruthers recently completed.

Port Arthur, Ont. — The Northern Navigation Co. will shortly call tenders for the lengthening of the steamer Huronic during the winter. It is proposed to put on a 60 ft. addition, making her 385 feet long.

St. Catharines, Ont.—Dredging on No. 1 section of the Welland ship canal by the Dominion Dredging Co., began Oct. 9, one dredge and two tugs being at work two thousand feet out from shore at Port Weller excavating for the new harbor. Quinlan & Robertson, sub-contractors for O'Brien & Doughney on section 3, Thorold, have one steam shovel in action and another is being fitted up. The Niagara, St. Catharines & Toronto Railway is rushing work on the track lying along that portion of the work on No. 1 section. Another and larger dredge is expected at Port Weller from Belgium within a few days.

New Incorporations

The Prest-O-Lite Co., Inc., incorporated at Toronto, to manufacture and sell acetylene, and to manufacture and sell other automobile accessories.

Berkel-Freeman Slicing Machine Co., Ltd., incorporated at Toronto, capital $40,000, to manufacture and otherwise deal in slicing and cutting machines, at Hamilton.

Kir-Benn, Ltd., incorporated at Toronto, capital $200,000, to buy, sell, manufacture and deal in wood, iron, steel and other metals, at Almonte, Ont. Incorporators: Alfred M. Greig, William H. Stafford, etc., Almonte, Ont.

Wallaceburg Oil Refining Co., Ltd., incorporated at Toronto, capital $200,000, to manufacture and deal in petroleum and all products thereof, at Chatham, Ont. Incorporators: David A. Gordon, Hugh A. Stonehouse, etc., Wallaceburg.

The North American Development & Construction Co., Ltd., Winnipeg, Man., has been incorporated with a capital stock of $100,000 by Standish R. G. P. Vereker, of Hamsterley, England, W. J. W. Bullock and others to construct and equip hydraulic and hydro-electric plants.

The Westbury Electric Light & Power Co. has been incorporated at Quebec, Que., as an electric light, heat and power company in the towns of Cookshire and East Angus, Que., with $75,000 capital. Incorporators—H. A. Worby, Cookshire; G. W. Allard, Coaticook, etc.

Contracts Awarded

New Denver, B.C.—A Doucette has been awarded the contract for the construction of a powder factory here for the Steelite Explosives Co., of Nelson, B.C.

Montreal, Que.—John Watson & Son, of Montreal, Ltd., have been awarded the contract for the ornamental iron work for the new building being erected for the Imperial Wire & Cable Co. at the corner of Shearer and St. Patrick Sts. W. J. Carmichael, architect.

Sault Ste. Marie, Ont.— In its agreement with this city, the Dry Dock and Shipbuilding Co. guarantees to deposit $25,000 as an evidence of good faith that construction of the plant will commence not later than April 1st next, and will be completed and ready for operation in two years from that date. In-ed assessment of $500,000 for the last ten years of the agreement the company now consents to pay the full taxes of $500,000 for fifteen years. The contractors will be Sir Douglas Fox and Co., a well-known British firm.

Building Notes

Assiniboia, Sask.—The Massey-Harris Co., it is reported, will erect a large warehouse here.

Fernie, B.C.—Joseph H. Frankel will erect an abattoir and cold storage plant on Government Block N. 44 adjoining the G.N. track.

Tenders

Victoria, B.C.—Tenders for the construction of two launches equipped with 25 h.p., 3-cylinder, 4-cycle Samson heavy duty engine will be received by W. E. Titchburn, inspector of Indian Agencies, Box 775, Victoria, B.C., up to November 1

Toronto, Ont.—Four new steam pumps are required for the station on Poplar Plains Road, two of 20,000,000 gallon capacity, and two of 7,500,000 gallons capacity. Boilers will also be required. The Board of Control has authorized R. C. Harris, works commissioner, to call for tenders.

Municipal

Hamilton, Ont.—The ratepayers have granted a franchise to the National Natural Gas. Co.

New Westminster, B.C.—On October 18 the ratepayers will vote on a by-law to authorize the purchase of the Westminster Gas Co.

Regina, Sask.—The ins[illegible] of an artificial gas plant is being agitated at Regina. It is believed that a plant will be installed at the commencement of the coming year.

Goderich, Ont.—A by-law granting a fixed assessment of $20,000 to the Goderich Organ Co., for ten years was carried Oct. 4, by the ratepayers. The Company has some important extensions to its plant in contemplation.

Water-Works

Sarnia, Ont.—A by-law to raise $12,000 to lay waterworks mains will come before the people on October 26.

Peterborough, Ont. — The city engineer will prepare new plans for the sewage disposal plant. A larger pumping station is necessary.

Ottawa, Ont.—Sir Alexander Binnie's recommendation regarding the water supply from the Gatineau Lakes is announced. The total cost will be $8,000,000. Provision is made for 25,000,000 gallons a day, or for 250,000 people. The Gatineau and Ottawa Rivers are to be crossed by bridges.

Trade Gossip

The Dominion Machine & Tool Co., 52 Spadina Avenue, Toronto, are removing to 386 Wellington Street West.

N. S. Steel Co. Output.—Nova Scotia Steel & Coal Co.'s output for September was: Coal mined, 68,800 tons; ore mined, 60,205 tons; pig iron made, 7,225 tons; steel ingots made, 8,800 tons.

The B. F. Goodrich Co. Akron, O., makers of automobile tires, who have been reported several times to be contemplating the establishment of a branch plant in Canada, have abandoned the project.

Dr. Rudolf Diesel, inventor of the Diesel oil engine, mysteriously disappeared from a boat on which he was crossing from Germany to England recently. His body has since been found by a boatman.

The Ottawa & Hull Power Co. have decided to increase their power plant by the addition of two water wheel type alternators, each of 6,750 k.v.a., 120 r.p.m., 2,300 volts, and also two transformers, each 6,750 k.v.a. 2,300-12,000 volts. The contract for this addition has been awarded to the Canadian General Electric Co., Ltd.

Power Company Barred.— "No injunction has been granted against the Edison Electric Co. of Detroit, to restrain them from coming over into Ontario," said Hon. J. J. Foy, Ontario Attorney-General, last week. "If any effort is made to cross the Detroit River at the point where it is anticipated the company wish to cross over into Essex, steps will be taken to stop them, and to conserve the rights of Ontario."

The Heaps Engineering Co., Ltd., who own the Schaake Machine Works at New Westminster, B.C., had a first-class display of machinery at the New Westminster Fair held recently. This included the Schaake shingle machine, two lath machines, two sizes of the Yale gasoline-distillate marine engine, and spare parts. The Schaake Machine Works were established in New Westminster fourteen years ago, and two years ago were taken over by the Heaps Engineering Co., Mr. Henry Schaake remaining as manager.

Personal

Dr. J. S. Unger and Chas. E. Dinky of the United States Steel Corporation, who were cariboo shooting in Nova Scotia recently, returned by S.S. Prospero from Sydney, last week.

Guy H. Morton, B.A.Sc., manager of the Calgary office of the Canadian Westinghouse Co., has been appointed lecturer in electrotechnics by the technical education committee of the Calgary Board of Education.

A. Junkens, vice-president of the Westinghouse, Church, Kerr Co., who were awarded the contract for erecting the C.P.R. depot and docks at Vancouver, recently inspected the work being done.

Collingwood Smith, the young son of the general manager of the Collingwood Shipbuilding Co., performed the christening ceremony of a Government dredge launched last week at Collingwood.

Stanley N. Graham, an Ontario man, has been appointed to the Chair of Mining, Engineering at the Nova Scotia Technical College, recently vacated by Prof. E. A. Holbrook. Mr. Graham was at one time on the staff of the Dominion Coal Co. Later he acted as instructor in mineralogy in the Kingston School of Mines, of which school he is a graduate.

Some Features of the Intercolonial Railway of Canada

This Government owned utility fills a large place in the development of the Maritime Provinces, and at the present time is attracting considerable attention on account of the proposed increase in freight rates, and the reorganization being effected since the appointment of Mr. F. P. Gutelius to the management.

ON the Intercolonial Railway of Canada, there are now nearly 1,700 miles of road in operation of the standard 4 ft. 8½ inches gauge, with 397 locomotives, 447 passenger cars, 12,025 freight and miscellaneous cars, and 78 snow plows. The road traverses the most varied and inviting scenery.

Starting at Montreal, the Intercolonial crosses the Victoria Jubilee Bridge on the St. Lawrence, and takes the shortest route to Quebec which is full of historic interest. Passing along the southern shore of the St. Lawrence, the road makes its way among picturesque French-Canadian villages, after which the romantic and beautiful scenic wonders of the mountainous districts is passed until Dalhousie on Chaleur Bay is reached. Here the great moose hunting and big game territory begins. A string of thriving towns has recently sprung up all along the road through New Brunswick. At Moncton the strange tidal phenomenon known as the Bore is first seen, and forms a remarkable feature of this interesting country.

Near Moncton is Point du Chene where steamers connect with the Prince Edward Island railway, the main line continuing to the furthest point of Nova Scotia, at Sydney, which together with North Sydney, is rapidly becoming a great commercial centre. A separate branch runs south through the center of Nova Scotia to Halifax. The entire route from Montreal to Halifax or Sydney is of surpassing interest, and the road and equipment are among the best in North America.

The Moncton Shops.

With regard to the principal repair shops which are located at Moncton, it will be recalled that they were completely destroyed by fire in 1906, and plans were immediately made for extensive works which now completed are among the largest and best equipped on the continent. The locomotive erecting shop, 375 feet by 80 feet, is itself more than twice as large as the old shops, and is arranged in departments each caring for certain similar parts of rolling stock. The machines are mostly motor driven. The pits are placed at an angle, or herring bone fashion to economize space. Two 60-ton electric cranes handle locomotives and all material needed in repairing same. The machine shop proper is divided into two bays, each served by a 10-ton traveling electric crane. These serve every machine tool, thereby abolishing hand and air cranes and leaving the shop light and open.

The brass and tool room is situated on the north-west side of the machine shop, and compares favorably with the old shop, having 3,800 sq. ft. more floor. The brass foundry adjoins, and between the two are placed racks for storing the castings on their way to the brass room. In the tool room where small tools are stored is located a grinding department.

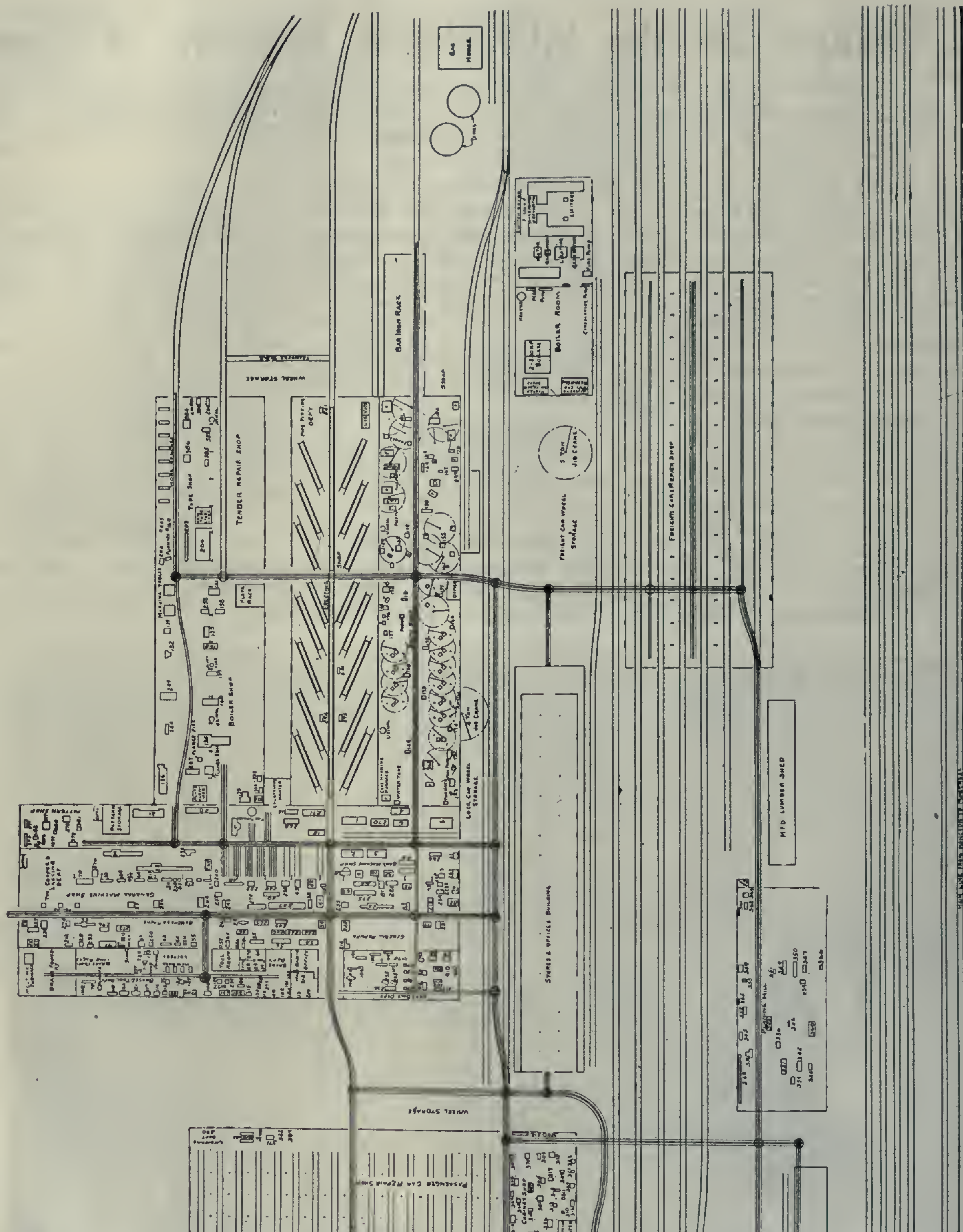
Passenger Car Shops.

The passenger car and paint shops comprise two buildings each 361 feet by 100 feet, and are built to handle 34 passenger cars; 22 was the capacity of those shops destroyed by fire. Between the shops is placed a traveling table on which the cars are placed for transfer to or from either shop or to the yard. This out-door table is placed well above the ground, so as to be clear of snow.

Car Repair Shop.

The freight car repair shop is arranged to accommodate 42 cars, and the ad-

THE OCEAN LIMITED, INTERCOLONIAL RAILWAY OF CANADA.



INTERCOLONIAL RAILWAY SHOPS LAYOUT, MONCTON, N.B.

joining planing mill is 203 feet by 82 feet. Only heavy lumber for freight and passenger cars is handled here. All of the new machines and also quite a number of the old machines are driven by separate motors; some of the related machines are grouped.

The power-house, 203 feet by 62 feet, is divided into two parts, and in one is placed three boilers of 500 horse power each, and two fans for supplying heated air to the blacksmith and freight car repair shops. In the other part of the power house, two 500 horse power tandem gas engines direct connected with 300 kilowatt generators supply power to the shops. An air compressor of 2,000 cubic feet per minute capacity supplies air for all pneumatic purposes.

The Boiler Shop.

The boiler shop, 225 feet by 100 feet, is equipped with a 35-ton travelling electric crane, and a full complement of the latest machinery. A 10-ton crane is also in operation on one side of the shop. The smith shop, 375 feet by 75 feet, is equipped with furnaces operated by natural gas and arranged in pairs, and 5 large single forges. A number of steam hammers are in operation. The smoke is carried out beneath the floor by the down draft system, leaving the shop entirely clear.

The planing mill is situated convenient to the passenger car and freight car shop. The locomotive shops comprise the machine shop and annex, boiler shop, boiler erecting shop, engine erecting shop, and smith shop, all under one roof. The four latter shops are parallel to the main line, but at right angles to the machine shop.

TWO 60-TON OVERHEAD ELECTRIC TRAVELLERS LIFTING A 120-TON LOCOMOTIVE, I.C.R. SHOPS, MONCTON, N.B.

CAR SHOPS AT MONCTON, N.B., INTERCOLONIAL RAILWAY OF CANADA.

Locomotive Pits.

A notable feature in connection with the engine erecting shop is the arrangement of the pits. The main pit runs almost the entire length of the shop, while the track is continued across the machine and passenger car shops into the paint shop, where locomotives may be painted should the erecting shop be crowded. The side pits are all laid at an oblique angle to the main pit, and this arrangement provides greater facilities for stripping and repairing engines.

LOCOMOTIVE SHOPS, MONCTON, N.B., THE INTERCOLONIAL RAILWAY OF CANADA.

Output and Power Features.

The Intercolonial has, in addition to the large repair shop at Moncton, other shops at River du Loup and the Prince Edward Island Railway, which is a part of the Government Railways system, and operated by the same management and officials with headquarters in Moncton with large repair shops at Charlottetown, Prince Edward Island.

At the Moncton shops, the output is fifteen general locomotive repairs and rebuilds per month, and the passenger car-repairs are about 25, and the freight car repairs about 2,000 per month. Some car building is also done, about 100 freight cars per year having been turned out.

The producer gas plant supplied by R. D. Wood Co., has been shut down, as natural gas has been discovered near Moncton, and is being used in the Westinghouse gas engines, and also in all the furnaces in the blacksmith and boiler shops and brass foundry.

POWER HOUSE, SHOWING ONE OF THE 500 HORSEPOWER GAS ENGINES DRIVING 300 KILOWATT GENERATOR. I.C.R. SHOPS, MONCTON, N.B.

Power is generated by the gas engines for 1.167 cents per k.w. hour at the switchboard for operation and fuel, the cooling water forming a large part of this. The engines are giving perfect and satisfactory service, and have been in use three and one-half years, the last 9 months on natural gas.

Yards.

The yards are among the most extensive in Canada, and their construction is said to have cost more than the shops. They are divided into receiving and despatching yards, to and from St. John, Halifax, and Montreal. They cover some three hundred acres of ground, and contain ten separate yards with a total mileage of thirty-nine miles; or if laid in a continuous line, the tracks that go to make up its total would reach from Moncton Station to a point one mile beyond Sackville, a distance it takes the Maritime Express one hour and nineteen minutes to cover.

Moncton Officials.

G. R. Joughins is superintendent of motive power; G. F. Knight, assistant superintendent of motive power; W. E. Barnes, master mechanic; and H. D. Mackenzie, locomotive general foreman. We are indebted to Railway and Locomotive Engineering for the cuts and data for this article.

CANADIAN RAILWAY CLUB, MONTREAL.

At the last monthly meeting of this club held at the Windsor Hotel, Montreal, on the evening of October 14, a most interesting lecture dealing with "Construction Work on the National Transcontinental Railway" was given by Mr. R. F. Uniacke, Bridge Engineer, N.T.R. The lecture, which was illustrated by a large number of excellent stereopticon views, was followed with close attention by a large audience.

Mr. Uniacke began by describing the methods adopted for transporting supplies for the survey and construction camps in the more inaccessible parts of the country traversed by the railway. Most of this work was performed by dog teams in winter and by canoes in summer. As was only to be expected a majority of the lantern views shown illustrated the various types of bridges on the system and the methods of erection used. Others illustrated the difficulties the engineers had to overcome owing to heavy fills and bridge abutments proving too heavy for the subsoil beneath.

A very complete description was also given of the huge car ferry now being built by Cammel, Laird & Co., of Birkenhead, Eng. This will be used for transferring trains across the St. Lawrence River until such time as the Quebec Bridge is completed. The ferry boat is to be of tidal deck type, with a rise and fall of 18 feet, which is the extreme difference in level at Quebec. The car deck will be raised and lowered by steel screws 6 inches in diameter, operated by bevel gears. At each end of the boat there is a hinged "apron" which forms a more or less flexible connection between the rails on the boat and those on shore. The apron extends beyond the end of the boat, so that latter does not have to touch the dock.

This ferry will cost about $565,000 to build and is expected to be in operation by May, 1914. On the completion of the ferry it will be used to transfer local traffic between Quebec and Levis, since the Quebec bridge is situated some six miles above the city.

At the conclusion of the lecture a hearty vote of thanks to Mr. Uniacke was passed, all present agreeing that a more interesting paper had seldom been presented before the club.

PRESENTATION TO MR. J. STANLEY COOK.

On the afternoon of Friday, October 10, members of the Montreal Metal and Hardware Association met in the Council Room of the Board of Trade, the occasion being the presentation of a handsome silver salver and entree dish to Mr. J. Stanley Cook, assistant secretary to the Montreal Board of Trade, who a few days later was married to Miss Diemer, of Cleveland, Ohio. Among those present were: Geo. J. Crowdy, vice-president; Alex. Gibb, treasurer; W. S. Leslie, W. Starke, Jas. Davidson, W. J. Hayes, Walter Dorken, T. H. Jordan, J. H. Hanson and A. J. Wood.

The presentation was made by Mr. Crowdy, who expressed the appreciation of the Association for the numerous courtesies which Mr. Cook had extended them during past years. Mr. Crowdy also extended the Association's heartiest wishes for the happiness and prosperity of Mr. and Mrs. Cook's married life, sentiment endorsed by other members present.

Mr. Cook returned thanks in suitable terms, and expressed the pleasure it had always been to him to be able to forward, in any way he could, the interests of the Montreal Metal and Hardware Association. The marriage took place in Cleveland on Tuesday, October 14.

The Electric Furnace Application to the Steel Industry*

By Wilfred Sykes **

In our October 16 issue, an illustrated description was given of an electric furnace installation at Toronto, Ont. The present article deals with the general development, progress and future outlook for this particular apparatus, as derived from observation and results of operation of a variety of type over a wide range of product.

THE practical uses of the electric furnace in the steel industry are these: (1)—Refining steel from open-hearth furnaces or Bessemer converters. (2)—Making steel from pig iron. (3)—Making steel from scrap. (4) Making steel for castings, and (5) melting alloys for use with open-hearth and Bessemer plants.

Function of the Electric Furnace.

The function of the electric furnace in refining is to maintain the metal at any desired temperature without the necessity of having present oxidizing or reducing gases. The electric furnace does not depend, for its action, upon any characteristic of the current, its sole function being to maintain the metal at any desired temperature. When the metal is maintained in a molten state, without the presence of any gases that might affect its composition, the ordinary metallurgical processes can be carried much further than is possible in an ordinary open-hearth furnace, so that the injurious constituents, such as sulphur and phosphorous, can be reduced to negligible values. The ease with which the temperature can be regulated makes possible the production of steels that can only be rivalled by the best results of the crucible.

Keeping in mind that the function of the electric furnace is simply to maintain the metal at the proper temperature to enable the metallurgical processes to take place, it is obvious that it is much more economical to partially refine the metal in an open-hearth or Bessemer plant than to attempt to make steel from pig iron direct, as the elimination of the bulk of the impurities can be as readily accomplished in the open-hearth furnace or Bessemer converter as in the electric furnace. The final elimination of the sulphur and phosphorous is the real field of the electric furnace, in conjunction with one of the present methods of handling the bulk of the impurities.

For handling large quantities of material, it would appear that the ideal arrangement would consist of a Bessemer or open-hearth plant to do the main refining, the electric furnace being used simply for the elimination of the occluded gases and the reduction of the phosphorous and sulphur to a negligible value. With such an arrangement, the power consumption is very slow, and the additional cost of the steel can be more than compensated for by the increased market value of the product.

Arc and Induction Types.

Both the arc and the induction type of furnaces have been used for this work. The arc furnace, from the standpoint of power supply, has some advantages over the induction type. It can be used on ordinary commercial frequencies and operates with a power factor from 70 to 90 per cent., depending upon the size, arrangement of leads, etc. Its first cost is considerably cheaper than the induction type.

The induction type of furnace has a very low power factor on the usual frequency of 25 cycles for sizes over one or two tons, and it has been found necessary to use frequency changers to supply the furnace with frequencies down to 5 cycles per second for larger sizes. The first cost of the induction furnace, together with the frequency changer, is, of course, considerably higher than that of the arc type.

The arc type requires carbon electrodes, and, on account of the construction of the furnaces, the life of the furnace arch is comparatively short, due to the intense radiation from the arc. The furnace cover is usually made removeable and it can be replaced in a short time. The life of the remainder of the lining is comparable with that of the open-hearth furnace. The difficulty of making large electrodes, 18 in. to 24 in. in diameter, such as are required for furnaces of 10 to 15 tons capacity, leads to excessive consumption, due to the poor quality. The mistake has been made of increasing the current density in some of these furnaces, so as to use smaller electrodes, but such an expedient leads to greater electrode consumption.

The electrode consumption is a very important item in the cost of steel production. In some of the earlier experiments made in the United States, the cost of electrodes varied between $2 and $3 per ton of steel produced. This figure has been reduced, due to the experience gained, but, even at present the electrode consumption of a 15-ton furnace is approximately $1 per ton of steel produced, and it is not anticipated that this cost can be reduced below 75c. per ton of steel.

The absence of electrodes in the induction type of furnace is a very important advantage, and the absence of the intense radiation of the arc enables the lining of the furnace to be used for a much longer period than is possible with the arc type. Records have been obtained from induction furnaces showing a lining life up to 500 charges, which is many times in excess of what can be obtained with the arc type. The induction type of furnace also has a thermal efficiency of approximately 10 per cent. more than the arc type. This is, however, probably offset by the loss in the converting machinery required to give the low periodicity for this type of furnace.

Both types of furnaces are in practical use for the final refining of steel, and from the standpoint of the quality of material obtained, neither type seems to present any particular advantage over the other. It might be mentioned that the construction of the arc type of furnace is preferable from an operating standpoint, as the slag is readily formed over the whole at the surface of the metal, and it can be more easily removed than is possible with the induction type, which has a comparatively small surface area in the form of rings around the transformer coils.

Making Steel From Scrap.

The electric furnace is used to some extent for making quality steel from cold scrap, and the arc type has been largely used for this purpose, due to the fact that no special arrangements are necessary to enable it to start with cold material. The field for this quality of steel can be seen from the following statistics of crucible steel production in the United States:

	1911, tons	1912 tons
Crucible steel ingots....	83,623	100,967
Crucible steel castings..	14,050	20,550

All this steel could be produced in electric furnaces if necessary.

The induction furnace must be started with a cast or welded ring in the metal trough, as satisfactory results have not been obtained by simply piling the scrap together. After the induction furnace is started, when using cold materials, only two-thirds of the charge can be poured, as one-third must be kept always in the furnace for starting the next

*From a paper read recently before the Association of Iron and Steel Electrical Engineers in New York.

**The Westinghouse Electric & Mfg. Co.

heat. The electrode consumption of the arc type, when operating under such conditions, is very high, due to the time each charge is in the furnace, the electrode consumption being a function of the time the furnace is in use. The quality of material produced by the electric furnace using cold scrap is at least equal, if not superior to, that produced in crucibles, and in Europe such furnaces are being used to a considerable extent for the production of fine grades of steel.

At the present time it is hard to say which type of furnace is considered the better for this work, as both types are used to about the same extent, but the convenience of the arc type in starting is an important consideration. The time per charge for the melting and refining is about 6 hours. It might be mentioned that the largest crucible steel manufacturer in America has recently installed an electric furnace for the production of crucible quality steel. The field is a fairly large one, as the production of crucible steel in 1912 was 121,000 tons, all of which could have been furnished by electric furnaces if necessary.

Steel for Castings.

One of the most promising fields for the electric furnace is the making of steel for high grade castings. A great deal of work has been done along these lines in Europe, and one or two concerns are using electric current for steel castings in this country. There is no doubt as to the field for small castings, providing a quality can be produced that has the qualities of good open-hearth steel. In 1912, 20,000 tons of crucible steel castings were made, and the electric furnace would have been able to produce the required quality of steel at much lower cost.

Up to the present time, the electric furnace has been used only for the production of comparatively small castings, but with the development of this trade, there is no reason why large castings, requiring high quality, should not be produced. The quality of castings produced is equal to those made by the crucible process, and naturally, the cost of production is considerably less. It is to be anticipated that, in the future, electric furnaces will be installed in our largest steel plants, for the melting of the alloys used in the production of steel. The induction furnace is probably the most desirable for this work, and this furnace load may be a factor that will be of interest to the engineer in charge of electric installation.

Arc Type Furnaces.

The earliest practical furnace was the Heroult, and, up to the present time, this type is still in the lead, as far as the number of installations is concerned, and capacity. With this type the arcs are in a series, and it gives the best electrical characteristics of any of the arc type. The voltage varies from 80 to 100, and the power factor from 70 to 90 per cent. on 25 cycles, depending upon the capacity of the furnace and arrangement of the leads. All furnaces of the arc type are open to the objection that the input fluctuates considerably, especially if started with cold material. When starting a furnace cold there are frequent short circuits, the current being only limited to the reactance of the furnace. In some respects, therefore, it is an advantage to have the furnace so arranged that the power factor is comparatively low, as this reduces the shocks on the power plant. With a large furnace, of say 15 tons capacity, the input will vary from 0 to 100 per cent. overload almost instantaneously. When the furnace is only used for molten metal, the fluctuations are not so great, but, even under these conditions, the power will vary from 50 per cent. of full load to 50 per cent. overload instantaneously.

The only other representative of importance of the arc type is the Girod furnace. This furnace has a single electrode, the current being conducted through the bath to the bottom of the furnace, which is connected to the other side of the line. Due to the fact that this furnace has only a single arc, the current required is greater, and, consequently, as a rule, the power factor is considerably lower than that of the Heroult type. To get the same power into the furnace, approximately twice the current is required, and consequently the difficulties experienced with the electrodes are very much increased. It has been the practice of Girod to use a higher current density than is adopted in the Heroult type, and consequently the electrode consumption is considerably greater, the best figures averaging at least twice those obtained with the Heroult furnace.

Induction Type Furnaces.

Of the induction furnace, the principal representative is the Roechling-Rodenhauser. This type is really a combination of induction and resistance furnace, and has been designed to work on a commercial frequency. On 25 cycles, the power factor of this furnace is comparatively low, not exceeding 50 per cent. with a furnace of eight tons capacity. For a large furnace it has been proposed to use lower frequencies, down to about 10 cycles per second, in order to obtain reasonable operating characteristics. This necessitates a frequency changer, which, on account of the special characteristics, is necessarily expensive At 10 to 15 cycles per second, its operation, however, would not be prohibitive.

The next important representative of this type is the Frick furnace, which has been used to some extent in Europe, and has been strongly advocated by its builders. From an operating standpoint, it presents a number of advantages, not the least being that the surface of the metal is horizontal, which is not the case with other induction furnaces, and consequently the amount of slag required to cover the surface of the steel is less. An undesirable feature is the very low power factor, which requires an extremely low frequency to make the furnace at all operative. For instance, a 20-ton furnace operating on 5 cycles has a power factor of only 50 per cent. and cannot be operated at all on 25 cycles. This is a very great drawback to this type, as special generating or converting equipment is required, the expense of which very greatly increases the cost of the equipment.

It appears that an ideal induction furnace is yet to be produced. The necessity of having some special generating or converting apparatus for large induction furnaces greatly restricts their usefulness, and for this reason the arc furnaces are used wherever possible in preference to the induction type. In the smaller sizes, the induction furnace can be used on 25 cycles, and they seem to present advantages over the arc type.

Future of Electric Furnaces.

During the last five years, the production of steel by electric furnaces in the United States and Germany, which countries are the principal producers, has been as follows:

Year	United States	Germany
1908	55 tons	19,500 tons
1909	13,762 tons	17,700 tons
1910	52,141 tons	26,200 tons
1911	29,105 tons	60,600 tons
1912	18,309 tons	74,200 tons

From this table, it can be seen that the production has greatly decreased in the United States during the last two years. This is, to some extent, due to the business conditions existing in the steel industry, and also to the desire to find out what results could be obtained from the rails that were made from electric steel in 1910.

Several years ago a quantity of rails were made in Germany from electric steel, but they have not yet been in use long enough to determine whether they are sufficiently superior to the ordinary rails to warrant the additional expense. For this reason, the progress in Germany has been slower than has been anticipated, the production of electric furnaces being mainly confined to high grade alloy and crucible steels. There seems to be little doubt that in time electric furnaces will supersede crucible in the production of high-grade steel. It will also be used to a considerable extent in the production of high grade castings, especially small castings, such as are used for automobiles, etc.

It is apparently an open question whether the electric furnace will be used at all for the production of rails and structural material. If it is not, then the field will be necessarily restricted to a comparatively small production. If it finds general use in the production of rails and structural material, then the electric furnace will become the most important piece of apparatus in the steel mill, and the characteristics outlined in the foregoing will present the problems of the first magnitude.

BUSHING GRINDING WHEELS.

WHILE it is of the utmost importance that grinding wheels should be properly bushed, very crude and inefficient methods are in use in many places, and it is not surprising that grinding wheel troubles result.

The suggestions given are based on the bushing methods in vogue at the Norton plant. The first requisite for bushing wheels is a chuck in order that the hole may be centred.

Bushing Material.

Lead can be judged by the color. Soft pig lead has a greenish purple tinge when hot. This is too soft for the bushing to retain its shape, and it will not stand careless handling when placed on a machine spindle. Frequently, the complaint that a wheel is "out of truth" is caused by the bushing being too soft. The lead, when hot enough to bush with, should be of a grayish color.

Babbitt is a much harder material, and, therefore, better adapted for bushing cup wheels with large overhang. Very coarse wheels that are subjected to hard pressure on the periphery stand up much better if bushed with babbitt.

Position.

One should be careful to see that the wheel lies flat on the bushing chuck; then move lever on chuck until the wheel is gripped tight, being careful to see that you do not raise the wheel from the chuck, otherwise you will have a lot of lead on the under side of the wheel.

It is advisable to remove the blotters from sides of wheel before bushing, but if you do not care to do that, make a paper collar the same thickness as the blotters, and small enough to go inside of hole in blotters and fit on the arbor. This will keep the new lead bushing even with the old one, and will save trouble with wheel running out on the sides. It is also advisable to put two or three notches in the old bushing, with a hammer and chisel, to make the new lead unite more securely with the old.

Operation.

First get the arbor of the size you desire to use and see that it fits in taper hole of chuck. After you are satisfied it fits, take out arbor, place wheel flat on chuck and move lever until tight. Then put in the arbor, slip the bushing cleaner over the arbor, holding it down firmly on the wheel. Fill the ladle with lead and pour it through cleaner hole into the wheel. Let it cool half a minute, turn the cleaner so as to cut off pouring tap, take off the cleaner, remove wheel from chuck and rest it on the floor or bench while you drive out the arbor. It is important that the lead bushing does not protrude outside of the wheel. It is, therefore, necessary to trim off the bushing with a chisel even after a cleaner has been used, as the lead will sometimes be above the side of the wheel.

Avoiding Trouble.

When the wheels are not properly bushed, they will run out of truth on the sides, which indicates that the hole is not at right angles with sides of the wheel. In mounting the wheel, a careless operator might not notice such a condition and tighten the wheel up against the stationary flange on his grinding machine spindle. Usually this breaks the wheel, but if it does not, the wheel is very liable to break when it comes in contact with the work. It is more dangerous when the wheel does not break when mounting, as placing it in contact with grinding work places extra strain on it, and the wheel breaks when revolving.

Another cause for breakage at times is that the bushing is left sticking out on the sides of grinding wheels. If they are mounted with lead bushings protruding, pressure on the lead, when the wheel is tightened in place, is sufficient to break wheels, or put such additional strain on them that they will break later while in use.

Sometimes, when wheels are piled one on top of another, a protruding lead bushing in the pile will cause such a strain from weight of wheels on top, that a soft or thin wheel will break under it.—Grits and Grinds.

PORT ARTHUR GOING AHEAD.

THE following figures show the amounts of grain shipped on vessels since the opening of navigation from the three elevators in Port Arthur, as compared with the same period of last year; the increase being twenty-five per cent.

	1912.	1913.
Wheat	13,985,360	13,684,115
Oats	4,585,670	5,605,575
Barley	591,405	1,655,785
Flax	1,918,650	3,413,830
Screenings.. .	4,950	108,635
Totals	19,366,035	24,467,950

The figures do not include the quantities loaded in the vessels wintering here, as there were about five million bushels loaded during last winter as against 1,500,000 loaded the previous winter.

AN OLD LANDMARK SOLD.

THERE will pass under the hammer on November 13th, the foundry of the Star Iron Co. at Beauharnois, Que. This is one of the oldest foundries in the Province of Quebec, having been in operation since 1878. Its principal product is the "STAR" boiler for hot water heating purposes. This boiler has long been a general favorite, there being, it is said, more than 6,000 of them in use in the city of Montreal alone, besides numbers scattered throughout the provinces of Quebec and Ontario. The supply of grate bars and other spare parts for boilers now in use would, it is expected, be quite a profitable business, and the foundry will doubtless realize a good price at the sale, which is to be held in Montreal.

BOAT BUILDERS ORGANIZE.

THE Canadian Association of Boat Manufacturers was organized at the Prince George Hotel, Toronto, on September 30, when two sessions were held and a committee was struck for the purpose of preparing the way for a motor-boat exhibition to be held in Toronto February 21 to 28 next. The objects of the association are to promote a fraternal spirit among boat manufacturers, eliminate unpleasant features of competition, and encourage higher standards of efficiency in boat building generally. The membership of the association will include boat manufacturers, marine engine manufacturers and naval architects. The headquarters will likely be in Toronto.

The officers elected are as follows:—President, H. Pitchburn, Gravenhurst, Ont.; First Vice-President, H. W. Going, Brockville, Ont.; Second Vice-President, Hugh M. Warnocker, Penetang, Ont.; Secretary, Adam F. Penton, Toronto; Treasurer, Claude H. Rogers. Executive Committee—M. M. Butler, Brighton; John A. Robinson, Toronto; H. L. Bastian, Hamilton; Fred Gilbert, Brockville; J. H. Roff, Orillia; J. W. Stone, Kenora, Ont., and A. L. Beaudry, Montreal.

Drill Jig and Fixture Design and Construction

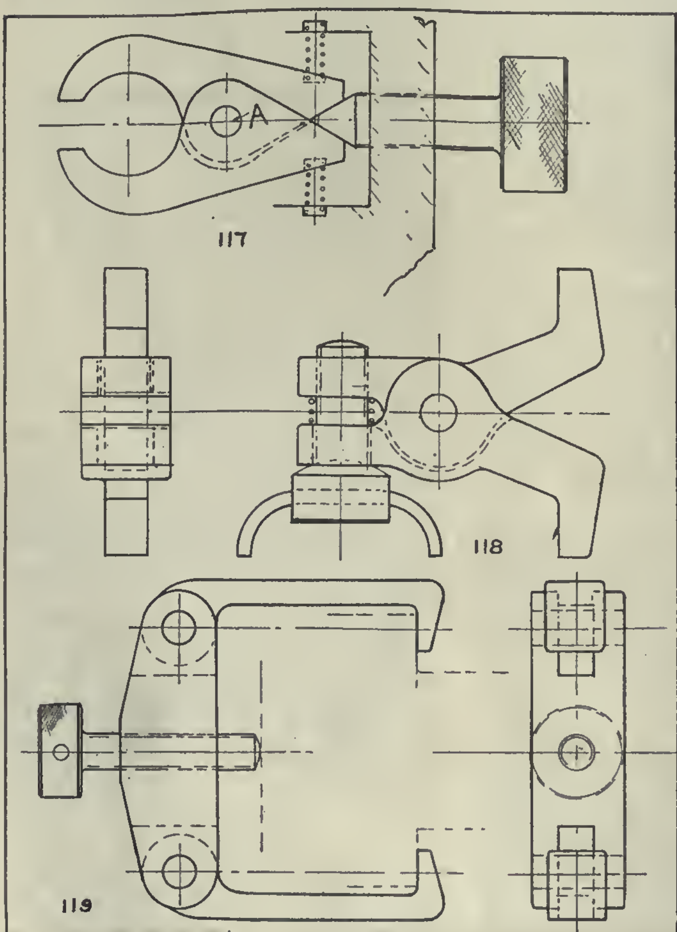
By H. R.

The sketches and data will, the writer hopes, appeal to machine shop superintendents, designers, toolmakers, and novices, as indicating the large place jigs of every kind and for every service occupy to-day in machine shop practice.

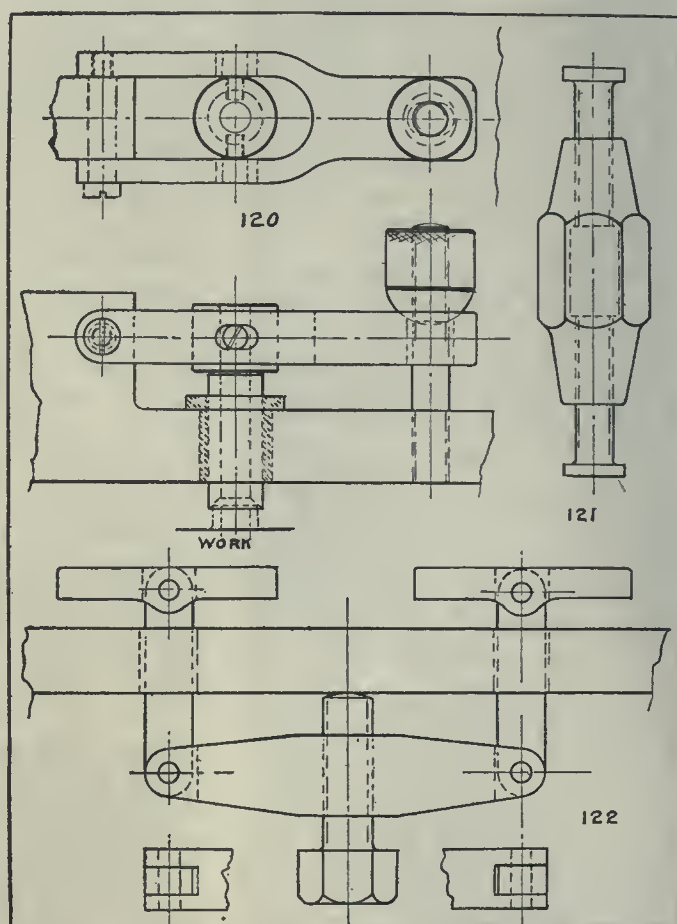
If a jig and fixture designer were asked, what is the difference between a jig and fixture? it is very probable that he could not make clear a distinction. To properly define the jig apart from the fixture is a very difficult proposition. The word jig is frequently used to denote almost any work holding appliance used in the manufacture of repetition parts. This is the same as the word fixture when used for all kinds of special tools. It can be positively stated that a jig is a special tool used in the manufacture of repetition parts while it accommodates the work or is held on the work, at the same time containing guides for the various tools that are to operate on the component, whereas a fixture is simply for holding purposes, or a manufacturing base for the work to be held upon, while the cutting tools are performing an operation, without having any special means for guiding the tools. The fixture, therefore, must be securely held to the machine table on which the operation is to be performed, and it may be provided with any number of stops or gauging pieces, although not containing any special arrangements for the guidance of the tools in operation. This explanation would define jigs as tools used exclusively in drilling and boring operations. Fixtures would be those tools used on milling machines, broaching machines, slotting machines, planers, shapers and grinding machines. Of course, tools for holding work on lathes are generally a combination of both.

A few general remarks on the principles of jig and fixture design will not be out of place. One big mistake quite frequently made is giving too little clearance between the piece to be machined and the sides of the jig. It is, therefore, as well to allow as much clearance as possible, and this should be particularly noted when rough castings or forgings are to be drilled or machined in the jigs. Sometimes surfaces which don't actually bear upon the work do not agree with the dimensions on the drawing. Particularly, therefore, in a cast iron jig should these allowances be taken care of. With regard to the locating points, it should be understood that in all instances these should be visible to the operator when putting the work into the jig; this will enable him to see that the work is in its correct place. Sometimes the design of the component to be operated upon prevents the locating points being readily seen. In these particular cases, a cored or drilled hole near to this point will enable same to be visible, thus giving the operator a chance of seeing if the work is resting on its proper place. Another point that should not be overlooked is that the swarf or chips are able to fall clear of the jig or fixture, or if it is not possible for them to fall clear, to make provision for them to be easily cleaned away.

The points so far referred to have been in relation to the holding feature, and the design in general for producing accurate work. Provision should also be made for clamping large jigs to the table of the machine on which operations are to take place. Small drilling jigs, for instance, are not clamped to the machine, but boring jigs and milling fixtures invariably have to be secured to the machine on which they are employed. Methods of securing these will



DRILL JIG AND FIXTURE DESIGN AND CONSTRUCTION.



DRILL JIG AND FIXTURE DESIGN AND CONSTRUCTION.

be illustrated. When jigs are made, it should be thoroughly understood that they must be finally tested for accuracy in the tool room, so as to determine if everything is in perfect order. This has particular reference to the locating points. Another feature usually overlooked is that when the work calls for great pressure on the clamps, and it is necessary for nuts and bolts to be used, there are sometimes several sizes put into the jig or fixture. This retards quickness of production from the operator's point of view, when he has to find several sizes of wrenches, to suit the various nuts. It should be aimed at, if possible, to work into the design of the jig all one size of nut, and it may be found necessary to re-design some jigs several times before producing a simple and satisfactory form. We can set down a few hard and fast rules on the principles of jig and fixture design, as follows:—

1.—Before planning the design of a jig or fixture, compare the estimated cost of production of the work with the present method of manufacture, making allowance for the outlay on the necessary equipment.

2.—Before laying out a jig or fixture, first decide on the locating points, and thoroughly fix a clamping arrangement.

3.—It is essential to make all clamping arrangements as quick acting as possible; this will save considerable time and money.

4.—Make the jig fool-proof, which means that you design the jig or fixture so that it is impossible for the component to be inserted wrongly.

5.—It will be found necessary to make some of the locating points adjustable on rough castings. Locate clamping devices in the best position to withstand all pressure of tools, and avoid all complicated arrangements which are liable to get out of order.

6.—Set all clamps, if possible, so that they do not project outside the jig; in other words, make the jig as compact as possible.

7.—Another important point is: Reduce the weight of the casting or jig as much as possible by cutting out unnecessary metal consistent with rigidity and strength. Do not forget to round off all corners, as it will save the operators many cuts.

8.—Provide all conveniences to facilitate handling the jig or fixture.

9.—Provide feet either formed out of the casting, or feet of steel case hardened, fitted into the jig, preferably four. This ensures a small true surface on which the jig will always be square.

10.—In all cases where there is a great amount of wear, such fittings as clamps, screws, nuts, studs, etc., should be case hardened. This will lengthen the life of the jig.

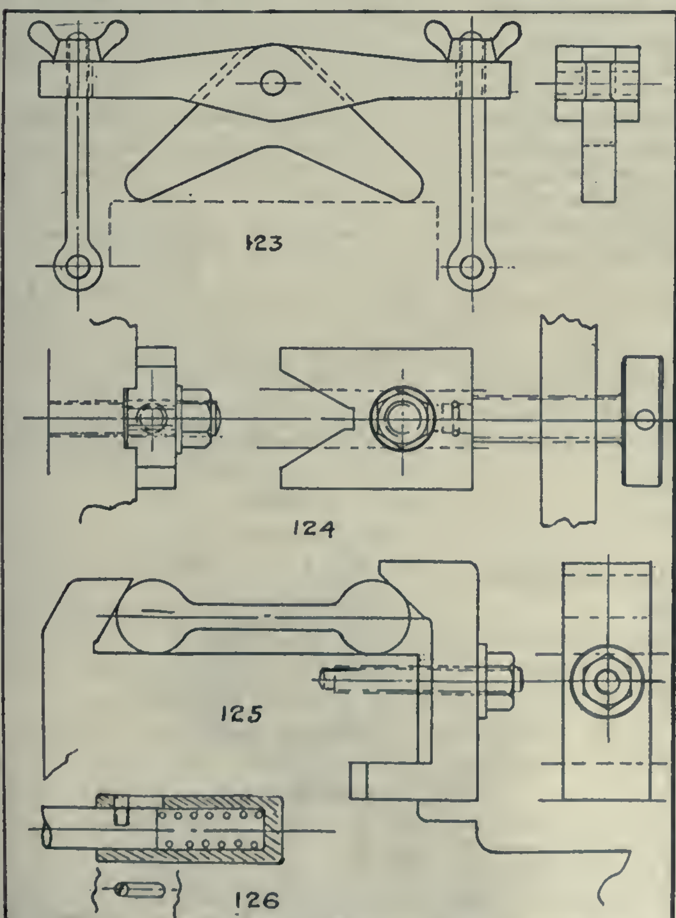
11.—Never drill the table of a machine to accommodate the holding down of jigs; always use (C) clamps, if slots are not provided.

12.—Provide the best means of clamping down the jig or fixture so as to prevent springing on all tools that must be held to the table of the machine while in use, and slots for keys for all milling, planing and boring fixtures, and spigots for lathe fixtures.

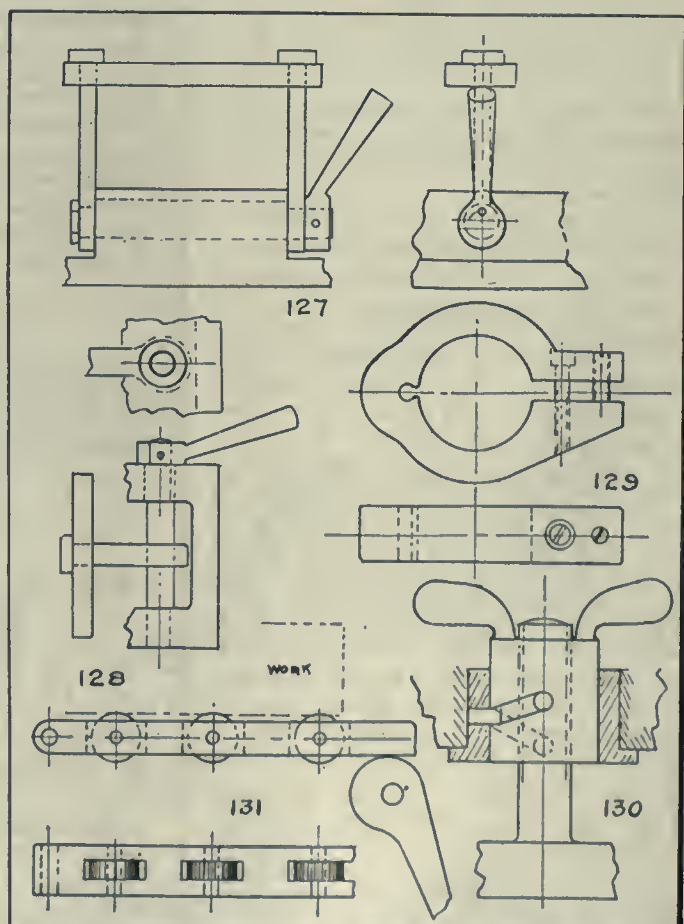
There are many useful methods still for me to describe in the way of clamping devices. Illustrated in Fig. 117 is an arrangement for clamping work that cannot be done by using the ordinary strap and bolt. Two levers or a pair of levers are fulcrumed at (A). It will be readily seen that by adjusting the screw, the taper portion tends to expand the ends of the levers inwardly. To reverse the action of these levers, the coiled springs act against the sides of the levers as the screw is reversed.

Fig. 118 shows a very complicated set of outer grip levers, in which the action of a coiled spring reverses the action of the levers, as in Fig. 117.

Fig. 119 depicts two swinging grip arms that are pivoted on a cross bar, which has the adjusting screw or the pressure appliance. It is most essential that the pivots or fulcrums of the out-



DRILL JIG AND FIXTURE DESIGN AND CONSTRUCTION.



DRILL JIG AND FIXTURE DESIGN AND CONSTRUCTION.

side arms should be in the direct line of pull, or it may be best to keep this line of action 1-16 in. inside. If this be made outside, the levers will expand outwardly to the line of action.

Fig. 120 shows what is termed a lever sliding bush, in which the work is held down by a bush, and is operated through a pivoted lever and pressure applied by means of a thumb nut. It will be seen that this is a quick operating device, and better than a screw-down bush, but it is rather expensive to manufacture, as it is necessary to have a long bearing for the bushing.

Fig. 121 shows a good way of taking the strain of the drill on a forked casting. This device has an adjusting hexagon nut with right and left hand threads, so that by turning the nut, the end pieces will expand. This jig will be found suitable for other work also.

Fig. 122 shows a combination of levers that are all operated by a screw. It is sometimes possible to arrange such a set of levers, and thereby save a great amount of time in clamping work.

Fig. 123 shows what is called an equalizing clamp or lever, which will be found very serviceable in work which has two bearing surfaces. It will be readily understood that there will be an equal amount of pressure on each end of the lever, even though the wing nuts may not be tightened exactly alike. In this arrangement the centre pin takes the full load or clamping strain, and should be, therefore, designed accordingly. The strap which is weakened by the slot should be thickened up as indicated.

Fig. 124 shows an adjustable vee clamp, adjusted on a tongue or key. An elongated slot in the centre accommodates the holding down screw, and constitutes a very good arrangement, the advantage being that when the vee block has been finally adjusted to the piece it can be held securely by tightening down the nut.

Fig. 125 shows another clamping device that may be useful. It will be seen that the work is not only clamped down by this method, but is located at the same time by the angle portions. The adjusting clamp is held square, and is kept from twisting by its opposite end.

Fig. 126 shows what is generally termed a spring stop, which will be found useful for locating work. In the last article I described cam levers.

Fig. 127 shows a double eccentric clamping arrangement, where the cam principle can be adopted. It consists of an eccentric shaft which takes its bearing in the centre, while the eccentrics are formed at each end, thereby operating two rods which gives them an even pressure. This clamping method is quick in its action, and can be thoroughly relied upon. The throw of the eccentrics may vary according to the work on which it is employed, being generally about 1-16 to ¼ of an inch.

Fig. 128 shows another arrangement which acts just as well as Fig. 127 for its particular work.

Fig. 129 shows a clamping ring which may be adopted under some circumstances.

Fig. 130 shows a good arrangement that will act on two surfaces.

When a large component is very heavy, it will be well to adopt the arrangement shown in Fig. 131, if at all possible, as by two or more of these combinations of rollers and the cam lever the work can be taken out of the jig with little exertion. This method can be employed on many drilling machines, especially the large types, and will soon save the expense of their being installed.

READER, WHAT DO YOU KNOW?

Among readers of Canadian Machinery there is a clearly defined sincerity of desire to know how each overcomes the daily tasks of the machine, pattern and blacksmith shops, the foundry and boiler shops. It is believed that your methods and devices, while good, may be improved, and thereby made more valuable if you publish them, so that other brains may work on them. We will provide the setting and pay you for the material. When your fellow tradesman puts the superstructure on your foundation, we pay him and pass the "kink" on to you, free. Get into the game.

HINTS FOR YOUNG PATTERN-MAKERS.

BE proud of your craftsmanship, prouder still of your craft; and uphold the dignity of both.

"Tearing it off," is the indulgence of the exceedingly skilful, or the very foolish.

"The race to the swift, to the victor the crown." True! but in pattern making, swift races should not be entered until the training is perfect and the practice sure.

Ambition begets perseverance; but should be leavened by reason.

Method is the first cousin of efficiency.

To read a drawing is, for a pattern-maker, not sufficient, he must visualise it.

Looking and seeing are both distinct and different. You "look" with the eye, but "see" with the brain; make sure you see through the drawing before you start the job.

The setting out of a job need not be a picture; but it must be a neat accurate working drawing.

All lines in a setting-out should be scribed, not pencilled; the latter are easily erasible, and being of vague and varying thicknesses are not conducive to accuracy or permanency.

Work to the dimensions given on a drawing, not to the scale. Print paper shrinks, and while a draftsman need only be "near enough," your work must be "IT."

A slave to custom can never be the servant of progress.

A "lagged-up" job saves weight and material; also if well made is as desirable as a solid pattern.

Circular end blocks for lagging allow any width of material to be used, but this advantage is offset by the more expensive circular fittings of the lags to the end blocks.

Polygonal end blocks require material of equal widths, but are an advantage, as the joints, being flat, are more quickly formed.

Polygonal end blocks should be worked altogether, as one whole. This keeps all the flats and angles in perfect alignment.

Because wood is common, it does not follow that it is cheap.

A **plank** in hardwood is any "stuff" upwards of 9 in. wide and 1¾ in. thick. In softwood, upwards of 10 in. wide and 2 in. thick.

A **board** is less than 2 in. in thickness, but over 6 in. in width.

A **batten** is between 1½ in. and 2 in. in thickness, but less than 9 in. in width.

A **deal** is over 2¼ in. thick; but less than 10 in. in width.

Quartering runs from 3 in. by 3 in., up to 4½ in. by 4 in.

Quartered planks are planks cut radially to avoid "casting," and although the most costly form of timber, they are the most economical for forming standard patterns. — Foundry Trade Journal.

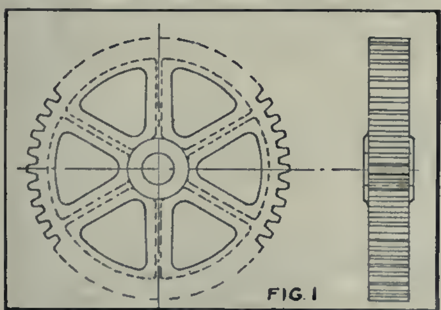
MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

WHEEL MOLDING BY MACHINE.

By H. Roberts.

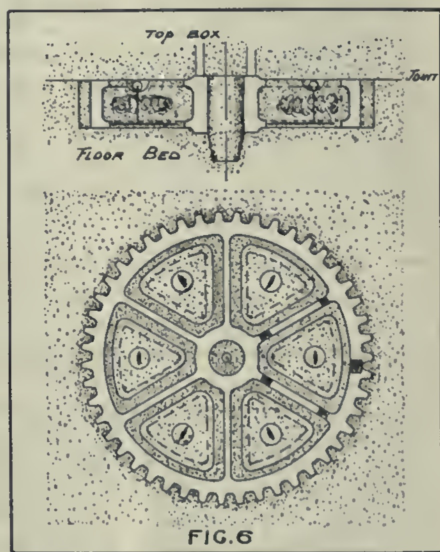
SINCE the introduction of the molding machine, great things have been accomplished in its rapid development through careful study and experiment by manufacturers. It is quite safe to say that there are few things that cannot be accomplished in the way of molding on modern molding machines. Wheel molding or toothed gears can now



WHEEL MOLDING BY MACHINE.

be done with ease and accuracy. With a molding machine the cost of expensive patterns is eliminated, which means that with a molding machine a part of a pattern is all that is needed for a toothed wheel. With the employment of machine mechanism more accurate results are produced in the spacing of the teeth than can be produced by hand work with a complete pattern. The toothed wheel molding machine has a complete dividing mechanism, which is operated by a complete set of change wheels, etc., for the spacing of the teeth, and with other arrangements of gears for withdrawing the tooth block pattern. Of course, the necessary cores are generally made on another machine or by hand. These are afterwards inserted into the mold by the molder.

The general procedure adopted to produce a successful mold is as follows:—The operator or molder is provided with all the necessary parts, such as tooth block patterns, striking boards, etc., which, of course, vary with the size or type of wheel to be produced, whether bevel, worm, spur, etc., and the design of the arms and shroudings. The illustration shows the molding of a plain spur gear, which has a plain top. The top box is rammed separately from the wheel mold upon a level sand bed. If the wheel be of large size, it will have to be made in the floor sand. A coke bed is made underneath, so that the whole of the wheel can be well vented in this bed. Small wheels are made in a bottom and top box. In the case of the spur wheel shown in Fig. 1, the bed and top joint face are made with a striking board, Fig. 2. On this board the half section of the wheel is marked so as to be a guide for the molder for setting the cores into the mold. This board is attached to the striking centre or bar (A) by a forged strap (B),, which can be adjusted on the bar by the set screw (C). The board strikes the face (D), the top joint face. The bottom of the bed (E) and (F) form a wall of sand at

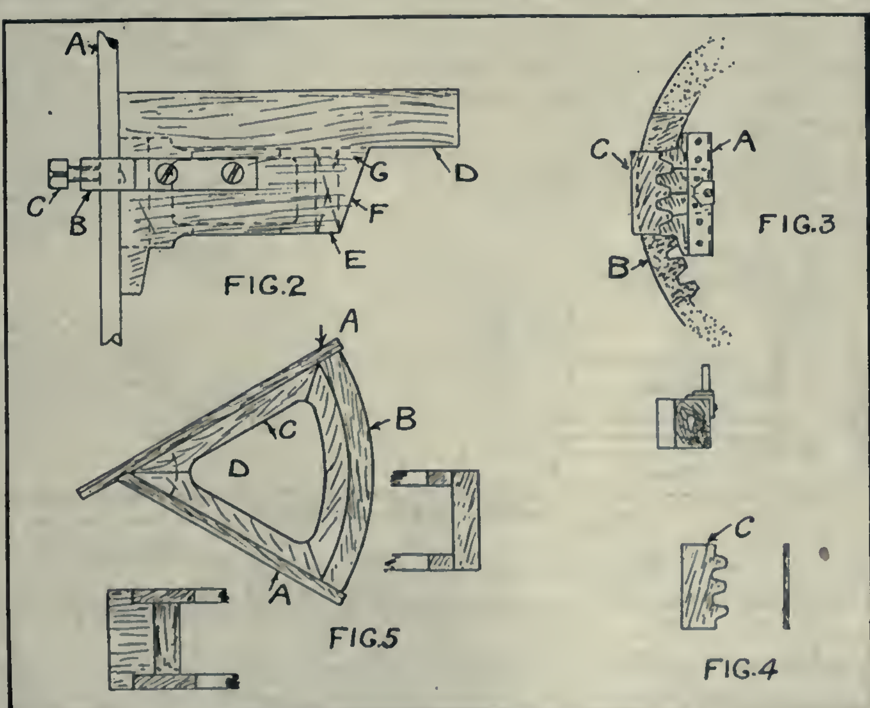


WHEEL MOLDING BY MACHINE.

3 inches away from the tooth point, leaving a space (G) for the facing sand. This is rammed within and around each tooth space. In the molding of bevel wheels it is much better to cut the board exactly to the diameter of the tooth points and the bevel.

To Form the Teeth.

The ramming of the tooth block (A), Fig. 3. follows. That illustrated has four teeth, but many contain more or less. It is as well to say here that the more teeth employed, the greater the accuracy demanded, because each tooth space must be a facsimile of its fellow. Each space has to be rammed up with the same precision and labor as any other, so that the only time saved is that of elevating the block. Using a tooth block, the spur shown on a bevel wheel block is bolted to the carrier of the machine, and the radius is set or determined by means of a strip cut to extend from the central striking point to either the root or point of the tooth, and the arm is permanently held by the set screw (C) in the position corresponding therewith. The block is lowered by means of the vertical slide of the machine until it touches, and then just presses upon the bed struck by the



WHEEL MOLDING BY MACHINE.

board, Fig. 2. After this procedure the ramming-up commences.

The ramming-up must be done carefully, so that the connection between the tooth spaces and the outer body of the wall of sand struck or formed by the sloping edge of the board, Fig. 2, shall be complete. There will then be no risk of the narrow streaks or pieces of sand in the tooth spaces being washed away. This is prevented by the use of nails, several being rammed in along with the sand, thus forming a bond of union. Facing sand is rammed inside the teeth to the thickness of about 1½ inches, with black sand behind. A block on one side keeps the sand from being rammed there. The tooth block is lifted by the vertical arm of the machine, while the sand is prevented from pulling up by holding a flat piece of wood (C), Figs. 3 and 4, on its surface. It is then moved a distance equal to the pitch by the dividing apparatus of the machine and lowered and rammed.

Method of Forming the Arms.

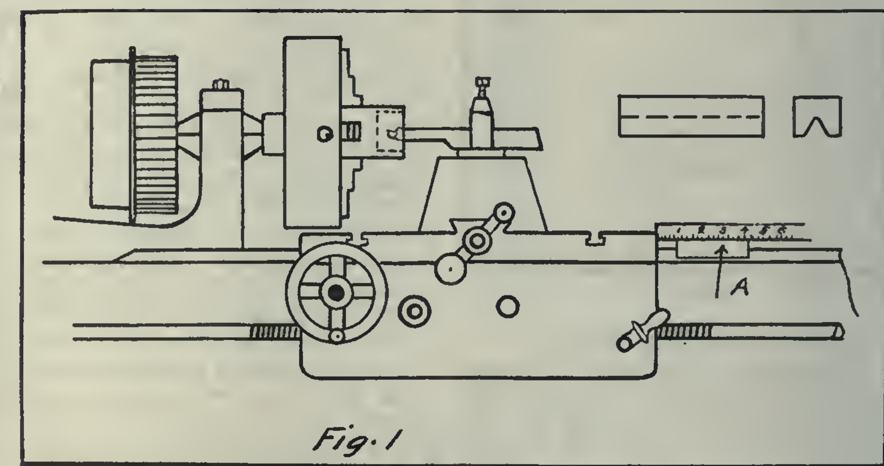
There are many different methods of formation adopted for spur wheel arms. The H section is the most common of all, because it is the easiest to make, and probably the strongest. Other forms are of course adopted, such as oval and cross section, etc. The core box is made of the form illustrated by Fig. 5 in the plan and part sections. The two sides (A) are notched together at the angle required for the arms, 60 degrees being the angle for 6 arms, 90 degrees for 4 arms, and 45 degrees for 8 arms. The inner faces correspond with the centres of the ribs, and the thickness of the ribs is equal to half the thickness of the arms. The inside of the sweep (B) corresponds with the inside of the rim of the wheel, while the flat arms (C) and the inner ribs (D) are divided to allow of delivery of the core. The core is rammed up, and the screws which connect up the sides of the sweep are withdrawn. The sweep (B) is drawn away horizontally, the sides being drawn away in the same manner, and the core left on the ramming board or bed. The finished mold is shown in section, and the plan in Fig 6, and indicate clearly the relations of the various parts. It should be clearly understood that, when setting the cores, great care must be taken in gauging the thicknesses of the arms and rim.

The full advantages of machine molding are most apparent in patterns of very intricate form, which involve more of the molder's time in sleeking and shaping of joint faces, and more work in the cutting of runners, etc. The highest economies are obtained when patterns of small or medium dimensions are grouped on plates with the necessary runners, and when joint faces are not plain. Patterns which are not cored, or one cored only very little, are more economically molded than those in which many intricate cores have to be fitted and properly secured. It is evident that shallow patterns and those without vertical edges produce the best kind of a mold. Deep patterns with vertical faces are better adapted for plate or machine molding when a stripping plate is employed.

SOME USEFUL KINKS.

By C.E.M.

To plane up a Vee Block to fit the ways of a lathe and to square both ends. When boring a recess a certain depth, place the boring tool against the outside face of the work and lay the vee block on the ways against the saddle. Bore the recess and measure the depth between end of vee block and saddle as indicated at A, Fig. 1. When "measuring back" for long threads, and when marking crank pin centres on multiple throw crank shafts, etc., the same method works equally well.



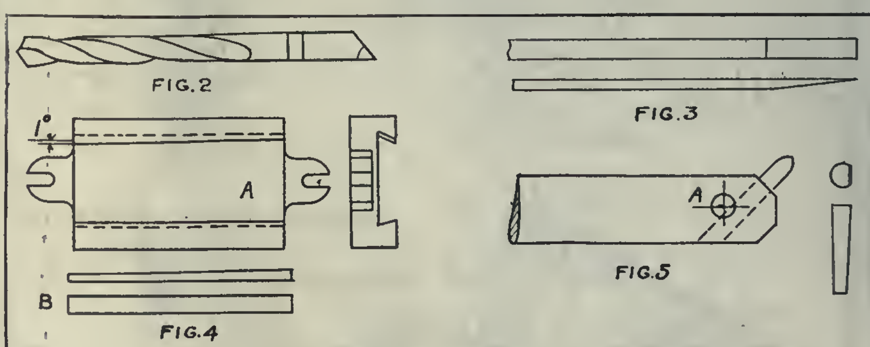
SOME USEFUL KINKS.

(2) It is often necessary to lay out a hole through one which is already tapped. An ordinary scriber is not satisfactory for this work. Take a twist drill, grind the shank as shown in Fig. 2, and put it through the tapped hole and turn it around. This gives a clear line, true with the bottom of the thread.

(3) Fig. 3 shows a scriber which will be useful for operations where a round scriber would not be suitable. As one face is perfectly flat, a line may be scribed very close to the straight edge, or it may be laid on a parallel and a line scribed even across an open face.

(4) Dies are usually held in cast iron shoes (A) by set screws, but a much better method is shown in Fig. 4. One side of the opening for the die is planed parallel with the casting and undercut as desired. The shoe is then "thrown around" about 1 degree and the other side undercut at the same angle. The gib B. Fig 4 is planed to the same taper as the shoe, and such a size as to fill the space between die and shoe. The dies, which are parallel, are placed in the shoe and the gib driven in. By this method the die is held more securely than with set screws, is far easier to loosen and is more durable.

(5) The following is a good method for holding a cutter in a small boring bar. A round or square cutter can be used, as desired. If a round cutter is used one side must be slightly flattened. Drill the hole (M) as indicated in Fig. 5. Make the locking pin a sliding fit in the hole (A), file one side flat and slightly tapered so that when driven tight against the cutter, the ends come nearly flush with the outside of the bar.



SOME USEFUL KINKS.

(6) Some time ago in looking over some new 5-16 in. drills I had purchased, I found one which was fluted left handed. It struck me as being something of a curiosity but I immediately saw a use for it. I laid it carefully away for removing 3/8-in. set screws. If we had much of this work to do I would buy left hand drills in all the tap sizes in use. By reversing the belt on the drill press, the left hand drill removes the burrs at the top of the thread and then unscrews the broken screw without injuring the thread in the least.

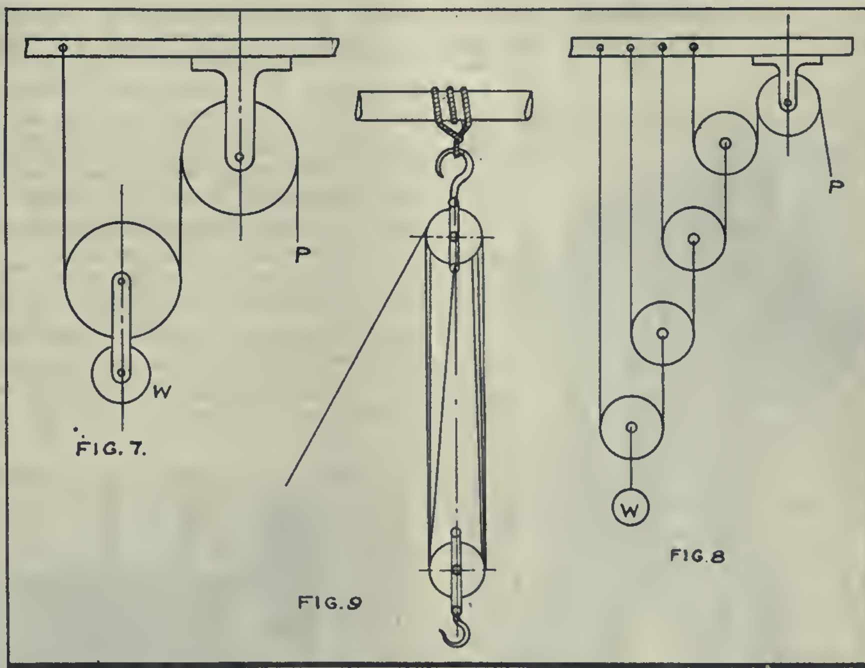
DATA ON ROPE SHEAVES.

By H. Womersley.

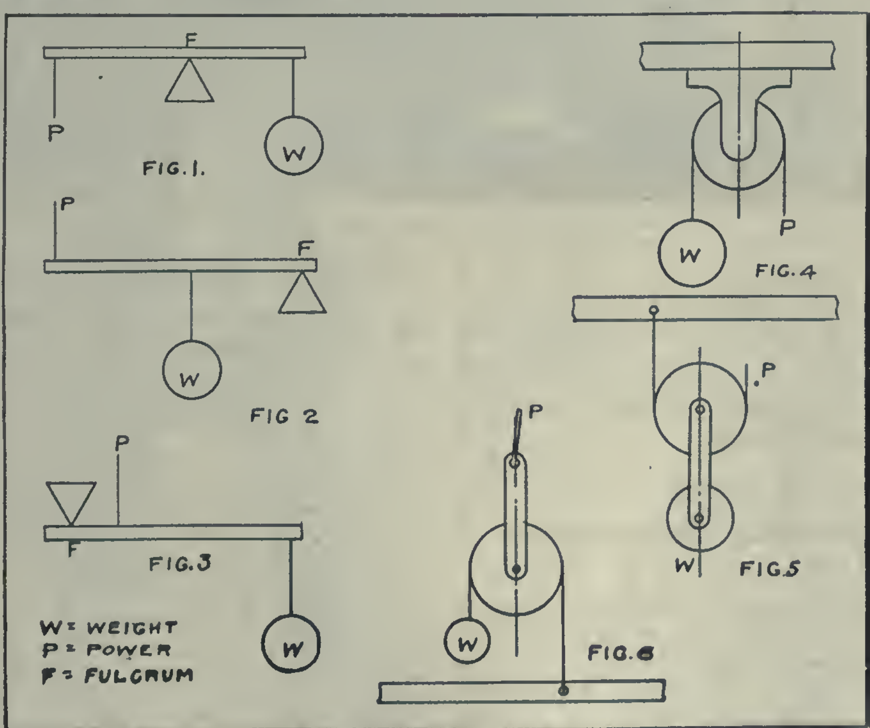
ROPE sheaves are an important factor in mechanical engineering, and much time is wasted, owing to men in charge not knowing the fundamental principles involved in their application. I have seen men sent out to work on jobs after the most haphazard fashion. The weight to be lifted, size of blocks, and the power required being never considered. Sometimes more men are sent on a job than are necessary, causing additional expense; while at other times too few are sent. Varied are the arrangements which can be made and utilized for lifting weights with rope and tackle, and, therefore, I will state the principles relative to rope sheaves as applied to mechanical power, transmission, so that the reader can work out the different problems which crop up when following an engineering occupation.

Mechanical powers are certain simple mechanical arrangements whereby weights may be raised or resistance overcome through the exertion of less power than is necessary without them. Levers come under the same class as rope sheaves; therefore, a few words on levers previous to dealing with the former will enable the reader to better follow the subject.

Levers are of three classes. In a lever of the first order the fulcrum is between the power and the resistance, as shown in Fig. 1. In a lever of the second order, the resistance is between the power and the fulcrum, as shown in Fig. 2, while in a lever of the third order, the power is between the fulcrum and the resistance, as shown in Fig. 3.



DATA ON ROPE SHEAVES.



DATA ON ROPE SHEAVES.

The rope sheaf consists of a wheel over which a rope is passed to transmit the force applied to the cord in another direction. There are two kinds of sheaves, one turning on fixed centres, the other turning on traversing centres. The fixed sheaf, Fig. 4, acts like a lever of the first order. It affords no mechanical advantage, and merely changes the direction of the force, affording greater facilities in the application of force, as it is easier to pull downwards than upwards. In this class, the power is equal to the weight to be raised.

The movable sheaf, Fig. 5, acts like a lever of the second order. One end of the rope is suspended to a beam, as a fulcrum, and the weight is attached to the axis of the pulley. This type of sheaf doubles the power at the expense of speed, the product of the power by the diameter of the pulley being equal to the product of the weight by the radius of the pulley.

A movable sheaf acting as a lever of the third order is shown in Fig. 6. One end of the cord is fixed to the floor, and the weight is attached to the other end, the power being applied to the axis. The power is equal to twice the weight, and the product of the power by the radius of the pulley is equal to the product of the weight by diameter of pulley. In Fig. 7 the power is equal to one-half the weight.

A combination of movable sheaves with separate and parallel cords is shown in Fig. 8. Each of them reduces the resistance to the extent of one-half; dividing and sub-dividing the weight successively by two as many times as there are movable pulleys, and the weight may be found by multiplying the power successively by two as many times as there are movable pulleys. Blocks and tackle of the usual kind are shown in Fig. 9. In this system of fast and loose pulleys there is one fixed and one movable block, and a single continuous cord, which is passed over the moveable and fixed pulleys in succession.

Rules and Examples.

I will give a few rules and examples bearing on how to find the power to lift a weight. and on how to find weight that will be balanced by a given power.

To find the power: Divide the weight to be raised by the number of cords leading to, from, or attached to the lower block, and the quotient is the power required to produce equilibrium, provided friction did not exist. When the fixed end of the rope is attached to the fixed block, the power may be found by dividing the weight by twice the movable pulleys, and when the fixed end of the rope is attached to the movable block, the power may be found by dividing the weight by twice the number of movable pulleys plus one.

To find number of sheaves or cords: Divide the weight to be raised by the power to be applied, then the quotient is the number of sheaves in, or cords attached to the rising block.

Example 1.—What power is required to raise a weight 3,000 lbs. by means of a four and five-sheaved block and tackle, the four sheave being the movable block. Necessarily, there are nine cords leading to and from the rising block, consequently $\frac{3,000}{9} = 333\ 1\text{-}3$ lbs. power required.

Example 2.—Suppose I have to raise a weight of 4,256 lbs. with power of 500 lbs., what kind of block and tackle should I use? Dividing $\frac{4256}{500} = 8.51$ cords, hence there must be four sheaves or 9 cords in the rising block.

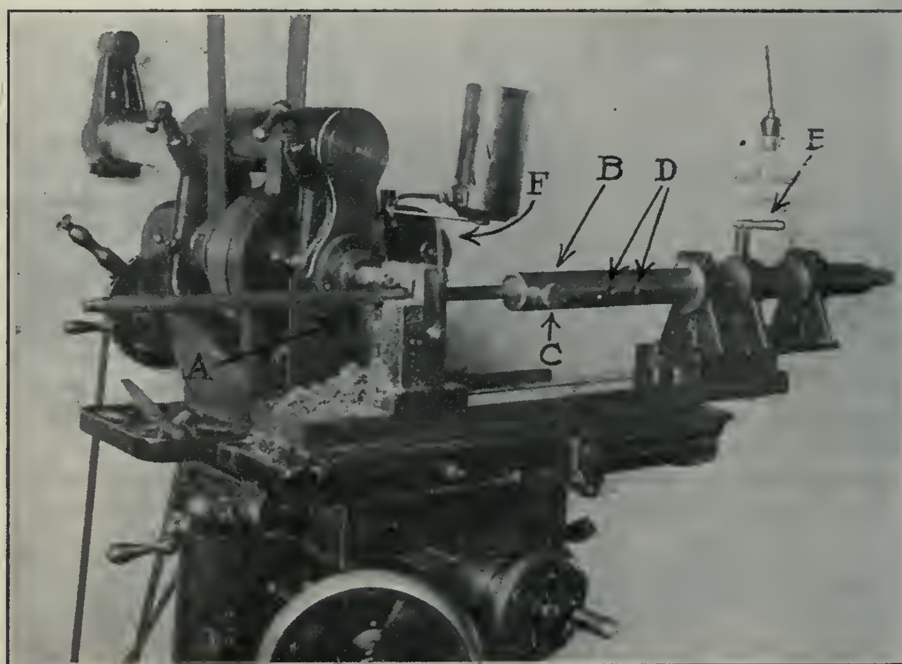
Rule 3.—To find the weight that will be balanced by a given power. When the rope is attached to fixed block, multiply the power by twice the number of movable pulleys, and when the rope is attached to the movable block, multiply the power by twice the number of movable pulleys plus one.

KEYSEATING AUTOMOBILE CAM-SHAFTS.

By A. E. G.

ONE of the large automobile companies, which uses the keyed-on type of cam on their valve operating shafts, uses the fixture shown in the accompanying halftone, to hold the shaft while milling the Woodruff keyways.

The shaft to be milled, is run through the arch of the rest (A), and the end is locked into the master bar (B), by means of the knurled-head screw (C). The master bar has hardened steel bushings like (D), set into it in positions corresponding to the exact positions of the keyseats to be cut. A hardened locating pin, operated by eccentric lever (E), is made to fit accurately into the bushed holes of the master bar, so that all the operator has to do, after placing his shaft, is to move the master bar so that the pin will go into the first bushed hole. The keyway is then cut by raising the miller table to a stop. The table is then lowered, and the bar moved till the pin will enter the next hole, and so on. The lever (F) operates an eccentric clamp, used to hold the cam-shaft firmly down onto the V of the rest. With this type of fixture, it is impossible for the most unskilled operator, to make a mistake in spacing properly.

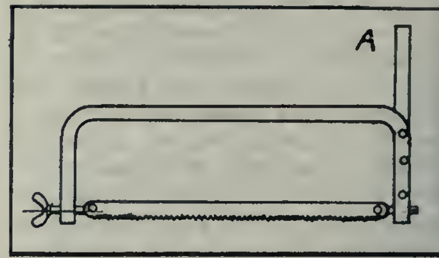


KEYSEATING AUTOMOBILE CAM SHAFTS.

HACKSAW FRAME DEVICE.

By A. L. M.

THE hacksaw frame shown here has been found very useful on odd-shaped pieces or large stock that could not be handled in the regular power saw. The frame is made heavy of wrought iron, the piece (A) being riveted to it and held in the tool post of a shaper. After removing the feed screw from the head. slack the gib enough to allow slide to drop of its own weight, and fasten clapper block so that it cannot lift on return stroke. The small square pieces inserted through frame to hold the saw take away any chance of saw twisting



HACK SAW FRAME DEVICE.

when being tightened. I recently took 6 cuts through $6\frac{1}{2}$ inches diameter tool carbon steel and received good satisfaction.

REPAIR OF FIRE-BRICK LININGS.

A MIXTURE consisting of equal parts of carborundum fire sand and fire clay or kaolin is extensively used for patching holes or broken parts of fire-brick linings and for filling open joints in furnace walls. It is used to good advantage in ordinary crucible furnaces for brass and steel, also in copper reverberatory furnaces for keeping the side walls in repair. By its careful use, it is possible to double the life of any fire-brick lining.

The mixture is largely used in repairing the Schwartz downdraught furnace, and also a wash applied daily after the melting. A mixture of equal parts of fire sand and fire clay is used successfully in repairing the brick linings of converters, which are subjected to extreme corrosion by the flame.

DEVELOPMENTS IN MACHINERY

A Record of New and Improved Machinery Tending Towards Higher Quality and Economical Production in the Machine Shop, Blacksmith Shop or Planing Mill.

DOUBLE ACTING SINGLE CAM PRESS.

THE double acting single cam press shown in the accompanying illustration is a new style of machine which has been designed for the purpose of handling celluloid and rubber, or other material that work better under heat up to 600 degrees Fahr. It is better suited for pliable materials than for metals. The machine is for the heating, as well as the working of the materials to be treated.

The press is simple in construction and easy to operate. The ram running between the outer gibs, or cutting ram, is actuated by two connecting rods which straddle the crankshaft and which operate at a stroke of 1 inch. The centre or drawing or forming plunger passes up and down through a bronze lining, inside of the blanking ram, and also has a special and separate adjustment. The top of this ram is made in the form of a yoke and is supported by a spring adjustment to the upper part of the frame of the press. It is actuated by a single split cam, Fig. 3, of hardened and ground tool steel. This cam is made in halves, and after hardening is accurately fitted. It is then taken apart, keyed and screwed on the centre of the crankshaft directly midway between the upper boxes of the press. While the cutting stroke of the outer blanking ram is 1 inch, the total drawing stroke afforded to the inner ram by this cam is $1\frac{3}{4}$ inches. When the press is started, both the blanking ram and drawing ram start, the path of the cutting or outer ram being one inch, all told, on direct eccentrics. The drawing ram travels downward $1\frac{1}{4}$ inches, dwells for one-quarter of the stroke, and then draws the remaining part of the stroke which is $\frac{1}{2}$ inch.

On the bolster plate of the press is set a special die holder, Fig. 1, two holes can be seen which are for the purpose of inserting electric terminals. In the chuck or punch holder of the press is a recess for two more electric terminals. These terminals are at right angles to those in the die holder, and there is one in the rear and the other in front, electrically connected. The die holder, as well as the punch holder, is cored out on the inside so as to permit these particular parts to be heated up to a temperature of 500 degrees. The celluloid or hard rubber is fed through the roll feed in cold stage as shown in Fig. 2, going from the rear of the press. The centre of the roll feed frame is located 8 inches from the centre of the ram, and is entirely separate from die holder or punch

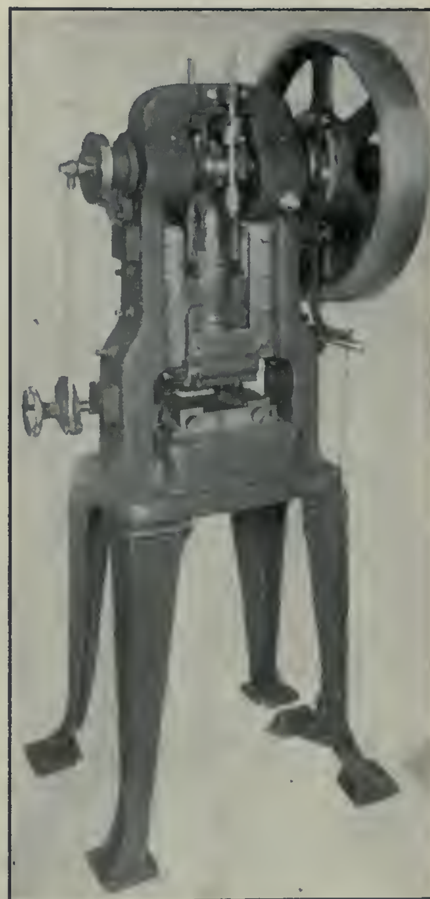


FIG. 1. SPECIAL DOUBLE ACTING SINGLE CAM PRESS.

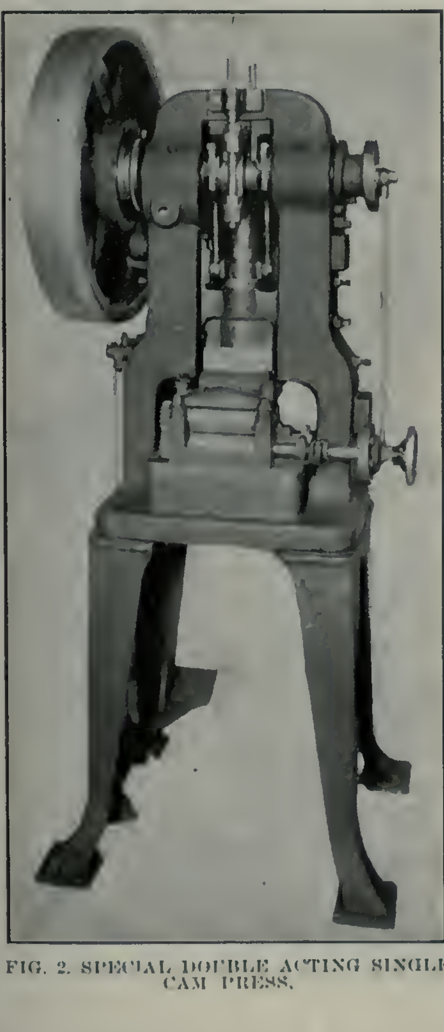


FIG. 2. SPECIAL DOUBLE ACTING SINGLE CAM PRESS.

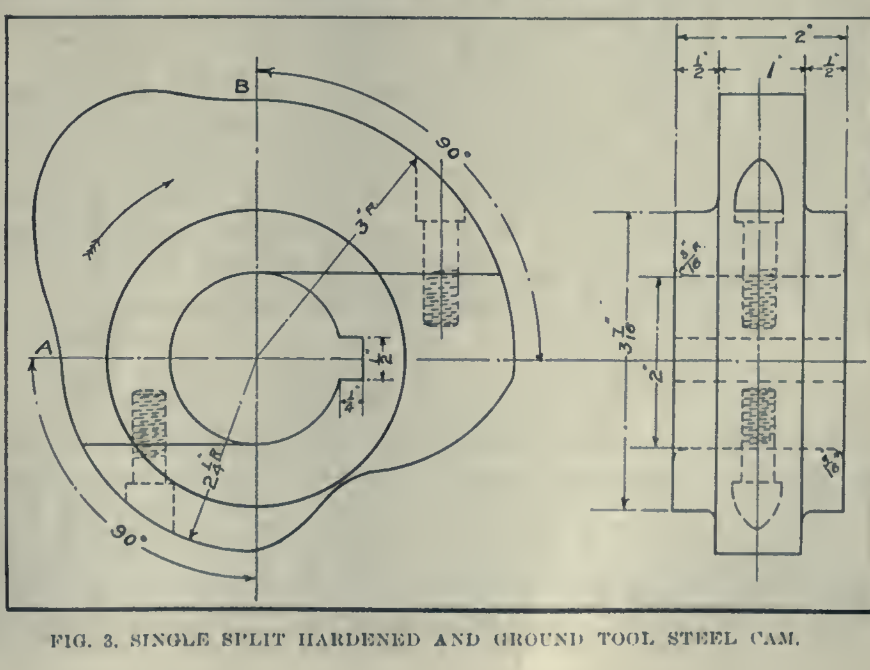


FIG. 3. SINGLE SPLIT HARDENED AND GROUND TOOL STEEL CAM.

holder, thereby allowing the temperature to be practically normal at all times, and, when the stock is passed through the feed, it is received through the dies cold. The press is started and cuts the discs from the sheet. The drawing ram then comes down and draws or forms them into the required shape. The object of allowing a dwell after $1\frac{1}{4}$ inches has been traversed is due to the fact that the material is very thick and this

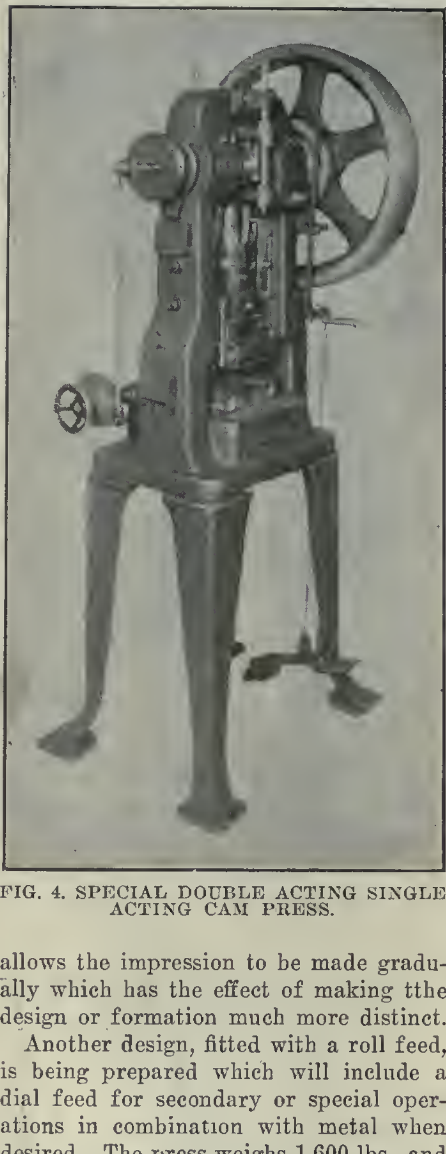


FIG. 4. SPECIAL DOUBLE ACTING SINGLE ACTING CAM PRESS.

allows the impression to be made gradually which has the effect of making tthe design or formation much more distinct.

Another design, fitted with a roll feed, is being prepared which will include a dial feed for secondary or special operations in combination with metal when desired. The press weighs 1,600 lbs., and occupies floor space of 24x30 inches, with an overall height of 6 feet.

The machine was designed, and is being put on the market by The Standard Machinery Co., Providence, R.I.

PILKINGTON'S GLASS FACTORY.

WORK on the new glass plant of Pilkington's, Ltd., at Thorold, Ont., is advancing, the foundations for nearly all the buildings having been completed. The steel framework, which is 200 x 90 feet, with a wing 100 x 90 feet in size, is well on to completion, and the excavations for the furnaces have been commenced.

In what is known as the "flattening" building, the steel girders are being erected on one side. This building will be 250 x 200 feet. A building for the production of gas and two large storage buildings are also to be constructed, and the excavation will begin soon. Railway switches are laid into the property, and a trestle to be used in unloading of coal is being built.

LACHINE CANAL RETURNS.

THE further the season advances, the greater grows the increase in the volume of traffic through the Lachine Canal. Grain passing through the canal into the harbor to October 1 is close on $14\frac{1}{2}$ million bushels more than for the corresponding period of 1912. Flax seed is responsible for nearly six million bushels of the increase, and wheat for over five million bushels. The only decrease is in corn, caused by the failure of the crops in the States of the Middle West, a failnre which has already resulted in two shiploads of corn being despatched from the Argentine Republic to Montreal direct. The coal trade shows a remarkable increase, the returns showing a total increased traffic of nearly 356,000 tons. All other analyses of the figures for 1912, compared with those for the present season, show increases as remarkable in their way as those quoted above.

Cereals.

Wheat brought down to the harbor measures up to 20,621,325 bushels for 1913 up to September 30 inclusive, as against 15,574,659 bushels for the corresponding period of 1912, an increase of 5,046,666 bushels. Corn shows a decrease of 55,697 bushels, the figures being 182,718 bushels for the present year and 238,415 for 1912. Oats have increased by 1,430,307 bushels, the quantity for this season to date being 7,907,473 bushels, as compared with 6,477,166 bushels for the corresponding period of 1912. Barley has increased by 2,160,614 bushels. For 1913 to date, the return is 2,623,258 bushels, as compared with only 462,744 bushels, an increase which is in one respect, more remarkable than any, in view of the slender proportions of the traffic last year.

Rye measures up to 270,249 bushels, the traffic in this cereal having been practically nil last year. Flax seed shows an increase of 5,596,566 bushels, the figures for this season being 5,971,311 bushels, as compared with only 374,745 bushels last year. The total quantity of grain brought down the canal for this season to date is 37,576,434, as compared with 23,127,729 bushels for 1912 up to September 30 of that year, an increase of 14,448,705 bushels.

Coal.

Coal brought down the canal this year, so far, weighs up to 679,763 tons, as compared with 355,846 tons, and coal landed at various points on the canal banks 340,463 tons, as compared with 308,438 tons, an increase to the harbor of 323,917 tons and to the canal banks of 32,025 tons.

Permits issued to boats to pass through the canal this season to date number 4,933, as compared with 4,525, an increase of 408 permits.

General Comparisons.

The following comparisons are for the month of September only, this year and last, and not from the commencement of the season: Number of trips made last month, 1,389, as compared with 1,346, an increase of 43. Tonnage operated last month, 711,203 tons, as compared with 576,308 tons, an increase of 134,895 tons. The number of passengers carried last month was 16,309, as against 11,682, an increase of 4.627 passengers. Cargo tonnage operated last month totalled 601,350 tons, as against 447,493 tons, an increase of 153,857 tons.

WATCHING CANADA.

WARNING against Canadian competition in water transporation was sounded by John A. Bensel, State engineer and surveyor, in an address to the Chamber of Commerce, Buffalo, N.Y., recently. Canada, he said, is spending many millions on its waterways, and "if Buffalo is to retain her position as a great transportation point," said Mr. Bensel, "her people must never lose interest in the State waterways. Future competition with Canadian waterways must not be overlooked."

Pigeon, Pigeon & Davis, Patent Solicitors, Montreal, report that 164 Canadian patents were issued for the week ending September 30th, 1913, 109 of which were granted to Americans, 28 to Canadians, 14 to residents of Great Britain, and 13 to residents of foreign countries. Of the Canadians who received patents, 8 were residents of Ontario, 8 of Manitoba, 5 of Quebec, 4 of British Columbia, 1 of Alberta, 1 of Saskatchewan, and 1 of Nova Scotia. In the United States, for the same week, 496 patents were issued, 9 of which were granted to Canadian inventors.

Quebec, Que.—The Quebec Abattoir Co., recently incorporated, will build a plant here this year. Hon. J. E. Roberge, president.

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Vol. X. OCTOBER 23, 1913 No. 17

PRINCIPAL CONTENTS.

THE USEFULNESS OF DEPRESSIONS.

DEPRESSIONS, it would appear, in the opinion of men entitled to be regarded as authorities, have their duties. One of the latter, and perhaps the most important, is to shake water out of the scrip and inflation out of values. Casualties and crashes which added dramatic incident to the contraction of credit in 1907 left the public in the general belief that the wind had been thoroughly and ruthlessly let out of values, and credit had been enthroned on an absolutely solid basis.

Shortly after trade began to expand in 1909, and securities at the same time were steadily finding a market at better figures, it was authoritatively stated that the financial and commercial situation in Canada had not been as thoroughly purged of over-capitalization and inflation of credit as it ought to have been.

Times such as those of the past few months have disclosed to the public some weakness in the financial situation of Canada, especially in the overhead organization and capitalization of several important Canadian industrials. They were evident to close observers in the beginning of the year. By those familiar with their development it was regarded as quite certain that "fair weather" only could postpone re-organization. Re-organization of industries in which very large capitalization is involved is a very disturbing factor in commercial life.

A few years ago, it will be remembered, the tendency towards mergerizing every industry created the impression that the people were to be robbed and the captains of industry gorged with stolen wealth. Captains of industry worthily entitled to that appellation usually derive wealth as a result of a good part of a life-time's work in the exercise of ingenuity, method and hard work. In recent years, however, captains of capitalization have arisen who by a merging process extract from industries enjoying a moderate degree of prosperity sudden wealth and then leave the industries merged to depend on tariff favors and long and laborious struggles to make good the promises of the prospectuses.

Can it, however, be said that as business enterprises—the mergers and the combines—in Canada have made an extraordinary good record for themselves in the matter of earnings upon the capital invested? During the few months of the financial stringency of the current year there have been, to say the least, a few delinquents in the matter of dividends and delinquents also in the matter of interest on bonds.

It cannot be gainsaid that the captains of capitalization have been more successful than the captains of industry—those directly responsible for the operation of the actual plants. Fortunes have been made by those who handled the scrip, but it is those who turn the wheels and get the orders upon whose shoulders rests the responsibility for earning the dividends promised by the prospectuses. The latter have a very hard task "cut out for them."

Merger embarrassments, those under public scrutiny and those seeking to avoid the public gaze by private negotiation, need not cause the business community as a whole much worry. That investors should suffer is regrettable, yet the public stands to gain by the good work which depressions can effect. Such periods disclose the identity of corporations not on a sound basis. There is no lack of opportunity to profitably place at the disposal of Canadian consumers necessities for the manufacture of which Canada provides practically all the essential raw materials. Those which for success depend not unduly upon tariff protection, but upon skill in management, enterprise, and technical knowledge, and respect for the pockets of the consumer as well as the investor will win out and aid depressions in freeing Canadian industry of the promoter-financiers who leave on the credit of the country stains which are difficult to obliterate.

It is quite possible to over-rate the damage they can do. Canada is too vigorously active to be seriously encumbered by financial blundering. Production of real wealth is going ahead by leaps and bounds and will continue to do so. The field, mine, the lakes and oceans of the Dominion are yielding treasures in more generous quantities every year. So long as nature thus responds to the efforts of Canadians they can look forward to business conditions of a satisfactory character, not materially different from those of the period preceding present dullness.—MacLean's Magazine.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

	Mont'l.	Tor'to.
Grey Forge, Pittsburg.	.....	14.40
Lake Superior, charcoal, Chicago	.....	15 25
Middlesboro, No. 3	20 00	21 50
Carron, special	22 50	.....
Carron, soft	22 50	.....
Cleveland, No. 3	20 00	22 00
Clarence, No. 3	20 00	21 00
Jarrow	.....	23 50
Glengarnock	.....	26 00
Michigan charcoal iron	27 00	.....
Ferro Nickel pig iron (Soo)	.....	25 00
Foundry No. 1, Port Colborne	.....	$17 00
Foundry No. 2, Port Colborne	.....	16.50
Canadian Foundry No. 1	$19 15	.....
Canadian Foundry No. 2	18 65	.....

BILLETS.

	Per Gross Ton.
Bessemer billets, Pittsburgh	$23 50
Open hearth billets, Pittsburgh.	23 00
Forging billets, Pittsburgh	29 00
Wire rods, Pittsburgh	26 50

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto	2.10
Steel bars, f.o.b., Toronto	2.15
Common bar iron, f.o.b., Montreal.	2.10
Steel bars, f.o.b., Montreal	2,20
Bessemer rails, heavy, at mill	1.25
Steel bars, Pittsburgh, future	1.40
Tank plates, Pittsburgh, future	1.35
Beams, Pittsburgh, future	1.40
Angles, Pittsburgh, future	1.40
Steel hoops, Pittsburgh	1.60
F.O.B., Toronto Warehouse.	**Cents.**
Steel bars	2.30
Small shapes	2.40
Warehouse, Freight and Duty to Pay.	**Cents.**
Steel bars	1.80
Structural shapes	1.90
Plates	1.90

Freight, Pittsburgh to Toronto.

18 cents carload; 21 cents less carload.

IRON PIPE FITTINGS.

Canadian malleable, 40 per cent.; cast iron, 65; standard bushings, 70; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 75; malleable, lipped unions, 65.

NAILS AND SPIKES.

Standard steel wire nails, base	$2 35	
Cut nails	$2 60	2 65
Miscellaneous wire nails	75 per cent.	
Pressed-spikes, ⅝ diam., 100 lbs.	2 85	

BOILER PLATES.

	Mont'l.	Tor'to.
Plates, ¼ to ½ in., 100 lbs.	$2.35	$2.30
Heads, per 100 lbs.	2.65	2.65
Tank plates, 3-16 in.	2.60	2.55
Tubes, per 100 ft., 1 inch	9.50	8.50
" " 1¼ in.	9.50	8.50
" " 1½ "	9.50	9.00
" " 1¾ "	9.50	9.00
" " 2 "	8.75	8.75
" " 2½ "	11.15	11.50
" " 3 "	12.10	12.00
" " 3½ "	14.15	14.50
" " 4 "	18.00	18.00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Stove bolts	80 & 7½
Machine bolts, ⅜ and less	65 & 5
Machine bolts, 7-16	57½
Blank bolts	57½
Bolt ends	57½
Machine screws, iron, brass	35 p c.
Nuts, square, all sizes	4c per lb off
Nuts, Hexagon, all sizes	4¼ per lb off
Fillister head	25 per cent.
Iron rivets	60, 10 p c off
Wood screws, flathead, bright	85, 10, 7½ p c off
Wood screws, flathead, brass	75, 10, 7½ p c off
Wood screws, flathead bronze	70, 10, 7½ p c off

National-Acme "Milled Products."

Sq. & Hex Head Cap Screws	65 & 10%
Sq. & Hex Head Cay Screws	65 & 10%
Rd. & Fil. Head Cap Screws	45-10-10%
Flat & But. Head Cap Screws	40-10-10%
Finished Nuts up to 1 in.	75%
Finished Nuts over 1 in.	72%
Semi-Fin. Nuts, up to 1 in.	75%
Semi-Fin. Nuts over 1 in.	72%
Studs	65%

Discounts f.o.b., Montreal.

OLD MATERIAL.

Dealers' Buying Prices.	Mont'l.	Tor'to.
Copper, light	$10 50	$11 50
Copper, crucible	14 00	14 50
Copper, uncr'bled, heavy	13 00	12 50
Copper wire, uncre'bled	12 50	12 50
No. 1 machine compos'n.	11 00	12 50
No. 1 comps'n turnings	9 50	9 50
No. 1 wrought iron	10 00	9 00
Heavy melting steel	8 50	10 00
No. 1 machinery cast iron	13 00	14 00
New brass clippings	8 50	9 00
No. 1 brass turnings	7 25	8 00
Heavy lead	3 75	4 25
Tea lead	3 00	3 20
Scrap zinc	3 00	3 50

WROUGHT IRON PIPE.

The following are Toronto jobbers' discounts on pipe in effect from April 21, 1913:

	Buttweld		Lapweld	
Standard	Black	Gal.	Black	Gal.
¼ ⅜ in.	62	47	....	....
½ in.	68	58	....	....
¾ to 1½	71½	61½	68½	58½
2 in.	71½	61½	68½	58½
2½ to 4 in.	71½	61½	70½	60½
4½ to 6 in.	....	....	71½	61½
7, 8, 10 in.	....	....	66	54
X Strong P. E.				
¼, ⅜, ½in.	56½	46½	....	....
¾ to 1½ in.	67½	57½	....	....
2 to 3 in.	68½	58½	....	....
2½ to 4 in.	....	....	65	55
4½ to 6 in.	....	....	64	56
7 to 8 in.	....	....	55	45
XX Strong P. E.				
½ to 2 in.	43	33	....	....
2½ to 4 in.	....	....	43	33

PRICES OF WROUGHT IRON PIPE.

Standard.		Extra Strong.		D. Ex. Strong.	
Nom. Diam.	Price. per ft.	Sizes Ins.	Price per ft.	Size Inz.	Price per ft.
⅛in	$ .05½	⅛in	$ .12	½	$ .32
¼in	.06	¼in	.07½	¾	.35
⅜in	.06	⅜in	.07½	1	.37
½in	.08½	½in	.11	1¼	.52½
¾in	.11½	¾in	.15	1½	.65
1 in	.17½	1 in	.22	2	.91
1¼in	.23½	1¼in	.30	2½	1.37
1½in	.27½	1½in	.36½	3	1.86
2 in	.37	2 in	.50½	3½	2.30
2½in	.58½	2½in	.77	4	2.76
3 in	.76½	3 in	1.03	4½	3.26
3½in	.92	3½in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4½in	1.27	4½in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.86	...	.....
7 in	2.38	7 in	3.81	...	.....
8 in	2.50	8 in	4.34	...	.....
8 in	2.88	9 in	4.90	...	.....
9 in	3.45	10 in	5.48	...	.....
10 in	3.20	....	....	...	.....
10 in	3.50	....	....	...	.....
10 in	4.12	....	....	...	.....

METALS.

	Mont'l.	Tor'to.
Lake copper	$17.00	$16.25
Electrolytic copper	17.00	16.25
Casting copper	17.00	16.00
Spelter	5.40	5.75
Tin	42 00	43.00
Lead	5.40	5.00
Antimony	8.50	9.00
Aluminum	22.00	18.00

SHEETS.

	Mont'l.	Tor'to.
Sheets, black, No. 28	$2.85	2.90
Canada plates, ordinary, 52 sheets	2 90	3 00
Canada plates, all bright.	4 00	4 15
Apollo brand, 10¾ oz. (American)	4 30	4 20
Queen's Head, 28 B.W.G.	4 40	4 40
Fleur-de-Lis, 28 B.W.G..	4 20	4 25
Gorbal's Best Best, No. 28	4 40	4 40
Viking metal, No. 28....	4 40	4 40

MISCELLANEOUS.

	Cents
Putty, 100 lb drums	$2.70
Red dry lead, 5 cwt. casks, per cwt.	6.00
Glue, French medal, per lb	0.10
Tarred slaters' paper, per roll...	0.95
Motor gasoline, single bbls., gal..	0.26
Benzine, per gal.	23½
Pure turpentine	0.60
Linseed oil, raw	0.60
Linseed oil, boiled	0.63
Plaster of Paris, per bbl.	2.10
Plumbers' Oakum, per 100 lbs....	3.25
Pure Manila rope	17

COKE AND COAL.

Solvay Foundry Coke	$5.95
Connellsville Foundry Coke	5.80
Yough, Steam Lump Coal	3.88
Penn. Steam Lump Coal	3.68
Best Slack	2.99

All net ton f.o.b. Toronto.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents.

Montreal, October 21, 1913.—In the machinery market no big business has been placed during the past week; but prospects have a generally brighter look than they have had for the past month or two. In fact the business in small pick-up orders has been quite good of late. Taken all round, conditions are good and there is no cause for pessimism. There is, perhaps, too much tendency to compare this year with 1912, which, of course, was an exceptionally good year. Most, if not all, of the machinery brokers, have done an increased volume of business, the increase in some cases being quite large. The Rudel-Belnap Machinery Co. have found their business expanding so rapidly that they are now about to open a branch office in Toronto. This will be in charge of Mr. A. E. Juhler, who has resigned his post as Toronto manager of the General Supply Company in order to accept the position.

Williams & Wilson have also had a very good year to date, their turnover having already exceeded last year's figures. This firm represents, among many other machine tool builders, the American Tool Works Co., whose Mr. J. B. Doan was in town recently to consult with them.

Pig Iron, Metals, Eetc.

The demand for foundry pig continues to be highly satisfactory. A. C. Leslie & Co. have again booked several good orders for English pig and fully expect that this state of affairs will continue right up to the close of navigation. Prices are quoted locally at last week's figures. Copper is unchanged. The present demand for this metal is very quiet. Lead shows a firmer tendency, but supplies for present delivery are practically non-existent.

General Notes.

On Friday, October 17, a meeting of the bondholders of the Canada Iron Corporation was held, when a resolution was passed authorizing the liquidators to borrow money up to $250,000 in order to carry on the foundry portion of the business, which comprises plants at Fort William, St. Thomas and Hamilton in Ontario; at Three Rivers in Quebec, and at Londonderry in Nova Scotia. The completion of the arrangements to carry on these foundries is important as it will mean the employment of a large number of workmen, and will in this way be of direct benefit to the municipalities where the plants are situated. It is further, a matter of general interest to all classes of the corporation's creditors. The foundry business of the corporation amounted to about $4,000,000 last year and while it has been affected by liquidation proceedings, and may not be as great this year, it is yet sufficiently large to form the basis for the reorganization of the corporation which is now being worked upon by the English bondholders who were here recently. It is further announced that it is not proposed to operate the furnace and mine departments of the corporation during the period of liquidation. Some of the plants are already closed, and the rest will probably be closed shortly.

An Ottawa press despatch states that Messrs. Thomas Cantley, of the Nova Scotia Steel and Coal Co., and Mr. W. B. Ross, of Halifax, who is closely associated not only with the Dominion Iron and Steel Co., but also with high Government officials, being a Senator, were in conference last week with members of the Government, and that strong pressure was brought to bear in order that further assistance of some character might be given to the iron and steel industry.

Toronto, Ont., October 21, 1913.—The following is a statement of the condition of the steel market in Pittsburgh at the present moment: Bars are especially strong considering the condition of trade; plates have a downward tendency, and have dropped five cents this week; structural steel is holding firm because the mills are filled up with orders for delivery within two and three months, and with these conditions there will be no drop in price. The steel business around Toronto is standing up well, much better than in July. Prospects are not very rosy for the winter. There may be a big demand in November for quick deliveries of structural steel to finish jobs. An engineer who does considerable building of warehouses and smaller structures stated this week that ninety per cent of his work was held up for want of money. The plans for his work are all ready, but he has no idea when the required cash will be forthcoming. Manufacturers are buying about as usual, especially in the east. Their orders are as plentiful as in the spring. The falling off in business will be due to a slackening off in the building trade. Inquiries for structural steel for next spring are away below average. Drummond, McCall & Co. report business rather quiet in all lines. Their mill business is slight, but their warehouse is busy, particularly in lines required for repair work. Makers of screws, nuts, bolts, etc., report no change in prices, nor do they expect any. They find trade a little better in these lines.

Machine Tools.

Inquiries for machine tools are few. The Toronto Structural Steel Co. placed their order for machine tool equipment with the A. R. Williams Co. this week. It called for an outfit costing about $3,000. The same dealers secured an order from the Algoma Eastern Terminals, Sudbury, Ont., through the Arnold Company, consulting engineers, of Chicago, for a drill press. Several other tools were required. The F. B. Sturtevant Co., of Galt, have bought a supply of machine tools from their Boston plant. W. F. and John Barnes, Rockford, Ill., have sold, through their Canadian agents, 15 Barnes drilling machines to the Massey-Harris Co. for their plants in Toronto and Brantford. The Canadian Fairbanks, Morse Co., the A. R. Williams Co., and Mussens, Ltd., each secured part of an order for machine shop equipment from the city of Fort William for their car barns. The Pollard Mfg. Co., Niagara Falls, N.Y., have bought a 12½-ton Niles crane for their new foundry from the Canadian Fairbanks-Morse Co. There is a big demand just now for individual electric lighting equipment. These usually consist of an oil engine, dynamo, storage battery and switchboard.

Metals.

Business in metals is stagnant. The market just now being very depressed. So far, dealers report no change as a result of tthe American tariff.

St. John, N.B., October 20, 1913.—At a meeting held last week, the Council of the Board of Trade decided to memorialize the Government with regard to the extensive development at Courtenay Bay in the hope that the work will be rushed to completion ahead of the time stipulated. J. Norton Griffiths, M.P., of London, England, who was in the city during the week made the statement that his firm who have been at work on the $12,500,000 contract at this site, could easily finish the work within two years before the time stipulated provided the department would vote sufficient money for the purpose. The contractors are anxious to complete the work. The necessity for the more rapid completion of the work will be brought out in the petition to be presented to the Government by the Board of Trade.

There has been much indignation in St. John over the announcement that the C.P.R. Empress steamers would not sail from the port this winter, but from Halifax, and a large committee from the Board of Trade went to Ottawa to press the claims of the city upon the Government. Amongst those in the delegation besides the mayor, were Hon. John E. Wilson, R. B. Emerson, Hon. W. H. Thorne, J. A. Likely, and other manufacturers.

F. H. Anson, of Montreal, vice-president of the Atlantic Sugar Refineries, Ltd., was in the city last week inspecting the work on the local plant. He said that he was very well satisfied with the progress made, considering the many difficulties encountered. The work on the new plant is well in hand and a large crew of men are employed in its construction.

Plans have not been definitely completed for the erection of the new buildings and plant for T. McAvity & Sons in the Marsh road, as there is some litigation over a question of a part of the land which they wish to acquire. One of the heads of the firm said that it might be a month and it might be much longer before they would have any definite announcement to make regarding the projected plant. This, it is understood is to be very extensive and it is said that the work will involve an outlay of at least $1,000,000.

Senator Domville said last week that negotiations between himself and an English syndicate had been completed whereby the extensive oil shale properties in Albert county, N.B., will be developed within a short time. Scientific tests have proved the value of the property. It is expected that an industry of no small magnitude will spring up, and the progress of the enterprise will be followed with interest.

The last of the lumber mills in St. John to renew operations since the strike of three months ago, started work this morning, being that of F. E. Sayre & Co. It has lain idle since the beginning of the strike. All the other lumbering plants are now going full blast.

A. W. Meakins, of the J. S. Metcalfe Construction Co., was in St. John during the week in connection with the building of the new grain conveyors at west side. The plans for the conveyors have been drawn up, but not yet received.

NO BOILER EXPLOSIONS.

JOHN W. PECK, chief inspector of machinery for the British Columbia Government, whose department includes the inspection of boilers, in his annual report for 1912, says that there were no boiler explosions in British Columbia in that year. There were three fatal machinery accidents only, and these were not due to any defect in the machinery. All three occurred in District B, which is Vancouver Island, the province being divided into four inspection districts, with headquarters in Vancouver.

It is significant of the industrial growth of the province that the number of new boilers inspected last year was 621, as compared with 287 in 1911. The inspector also notes that out of 968 plates for new boilers inspected in 1912, only eight were condemned, which is the best showing made by boiler plates in this province since the department was organized. The total number of new boilers on the books was 4,561.

As might be expected, the demand for steam engineers of all four classes brought forward a number of candidates for certificates in 1912. In all 1,113 men were examined, of whom 768 passed successfully. The majority of the candidates sat for fourth class certificates, there being 563 of these, of whom 346 passed. Only nine tried for first-class certificates, and 109 logging-donkey engine certificates were issued and 15 special locomotive.

ACCURATE SIMPLICITY.

By A. M. L.

A JIG or fixture is valuable only in proportion to its efficiency. Many of us have, in passing through factories, seen, and in a great many cases, had our attention proudly called to some elaborate fixture, designed for duplicate production. How often has our friend, the superintendent or foreman, explained same in about the following manner:—

"Here is a clever little attachment; the only trouble it ever gives us is keeping it clean, but the operator overcomes that by blowing it out with compressed air after each piece is machined. You see, when the piece is finished, we back up this screw, which releases the pin which allows this slide to slip out. Then, after removing that bushing, the work is turned a quarter of the way around, and you lift this little lever which allows the piece to be lifted out.

"Our output? Oh, about 500 per day of ten hours."

We pass on to where a boy is busy putting small parts in a little unpretentious jig under a drill press. His chief trouble seems to be to keep from whistling, which, if indulged in, would worry his neighbor across the aisle to a sufficient extent to cause him to forget the formula for placing pieces in his jig. We look over his shoulder. "Oh, there is nothing interesting in that jig," our friend informs us. "Just a block, a couple of pins as gauge points, and a wedge.

"Dirt? Oh no; it never gives us any trouble in that respect. There isn't any place for the cuttings to lodge.

"He drills about 3,000 pieces a day."

Again, we pass along to the next, and so on. Some are simple, some are complicated. Some are so simple that they seem ashamed of their simplicity; working along day by day, completely overshadowed by their grand and imposing, although not nearly so efficient brothers.

Let us not be misunderstood, however. It is not always practical to make a simple jig that will perform some delicate or intricate work; nor can all pieces be machined at the same rate per hour. We can, however, strive to increase our output by decreasing the complications attending many of our operations. This is an old story, a song of years ago, this song of simplicity, but may we humbly advance the statement that it is much more to the point to-day than ever before. Now, in the rush and whirl of things, now, in this day of top notch efficiency, let us post our motto at every corner of our shops: "Accurate Simplicity."

In this world, a man must either be a hammer or an anvil.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Engineering

Walkerton, Ont.—A foundry will be erected here by Isadore Ellinghausen.

Montreal, Que.—The Argus Fire Alarm Co. are building a new factory to cost $100,000.

Medicine Hat, Alta.—The Alberta Rolling Mills, Ltd., are planning an extension to the plant.

Windsor, Ont.—The Swedish Crucible Co. are erecting a plant here, and will manufacture automobile forgings.

Brantford, Ont.—A factory core room will be built by the Massey-Harris Co., Ltd., at a cost of $8,000. A. J. Cromar is general contractor.

Woodstock, Ont.—The Wayne Oil Tank & Pump Co., of Fort Wayne, Ind., will build a branch factory here. They ask for the loan of $12,000.

Gananoque, Ont.—A start has been made in rebuilding the spring factory of the Ontario Steel Products Co., which was destroyed by fire about ten days ago.

Montreal, Que.—A winding-up order has been granted by the Superior Court for the Canadian Drednot Motor Trucks, Ltd. A meeting of creditors was held on October 17th.

Vancouver, B.C.—Chief Engineer Conway, of the B. C. Electric Railway, announces that the company will build car repairing shops between Prior Street and Venable Street.

Vancouver, B.C.—Yarrow's, the British marine engineers, are contemplating erecting works at Esquimault, B.C., or at Vancouver, and perhaps in the Maritime Provinces. Mr. Yarrow is on his way to Canada.

Bridgeburg, Ont.—The Mesta Machine Co., of Pittsburg, Pa., have leased part of the Mentholatum Building, where they will manufacture plate valves. Operations should begin in January.

Goderich, Ont.—The American Road Machinery Co. have secured an option on several town lots five acres in area, and will shortly erect an addition to their factory. The proposed building will be 70 by 100 feet.

Montreal, Que.—Contracts have just been placed by the Eugene Phillips Electrical Works of Montreal for a large amount of new machinery with which to equip the $250,000 extension to their Montreal plant.

Collingwood, Ont.—The Imperial Steel & Wire Co. commenced operating the nail and wire mill this week. During the summer the nail department of the wire mill was closed down and a number of their employees let go.

Hamilton, Ont.—The Tallman Brass & Metal Co., Hamilton, Ont., have purchased the plant and machinery of Lomas & Nelson, art metal and electric fixture manufacturers, and will make electric fixtures from original designs.

Prince Albert, Sask.—The Royal Farm and Machinery Co., of Manitoba, have secured a free site of ten acres from the city, and will at once proceed with the erection of a factory and plant for the manufacture of all kinds of farm machinery, from a small cutter bar to a binder.

Electrical

Weston, Ont.—The Water, Power and Light Commission will instal high voltage tanks in the streets.

Fredericton, N.B.—Tenders will be called for an electric lighting and power system for the city opera house.

Yorkton, Sask.—The town is building a power house at a cost of $36,000. Ritchie & Walters, general contractors.

Bury, Que.—The Westbury Electric Light and Power Co. intend installing electric light in Bury in the near future.

Thorold, Ont.—A Hydro-Electric engineer has been appointed to estimate the cost of the system for Thorold township.

Welland, Ont.—The Canada Forge Co. have begun work on a new transformer house, which will double the capacity of their present one.

Hamilton, Ont.—Engineer Webb of the Ontario Hydro-Electric, is preparing plans for providing the township of Barton with hydro power.

Montreal, Que.—A winding-up order has been granted against the Universal Electric Economy Co., Ltd., on the application of Walter Rawlings.

Medicine Hat, Alta.—Plans are being prepared for an addition to the municipal power plant and the installation of machinery, estimated to cost $250,000.

Edmonton, Alta.—It is estimated by the Hon. Mr. Sifton, premier of Alberta, that there will be a surplus of $100,000 on the Government telephone operation for this year.

Cornwall, Ont. — The St. Lawrence Power Co., of Massena, has been granted permission to dredge the Grasse River, from the power house to its mouth, a distance of nine miles.

Gananoque, Ont.—John M. Campbell is building a dam at Kingston Mills to increase the fall from 10 to 40 feet. He will instal turbines, and generate electricity for local farms.

Edmonton, Alta.—Plans have been prepared and a tender obtained for a steam engine for the street railway power department. The price is $11,460. A surface condensing plant is also required.

General Industrial

Montreal, Que.—The Canada Cement Co. will equip a new $1,000,000 cement plant.

Windsor, Ont.—The Burlington Windsor Blanket Co., of Windsor, Ont., will locate in Toronto.

Regina, Sask.—W. H. Priest will build a woollen mill, 60 x 55 feet, employing 40 hands.

Edmonton, Alta.—The North-West Biscuit Co., recently organized here, are building a factory.

Victoria, B.C.—The British Columbia Pottery Co. plan to rebuild their plant recently damaged by fire at a cost of $125,000.

Pitt Lake, B.C.—The British Columbia Transport Co. will expend $100.000 for a rock crushing plant and other improvements.

Tillsonburg, Ont.—Snedicor & Hathaway's shoe factory, recently erected here, was damaged by fire to the extent of $1,000 last week.

Lindsay, Ont.—The local mill of the Canadian Cereal and Milling Co., has been closed. Others belonging to the same company will also be closed.

Medicine Hat, Alta.—The Hunt Engineering Co., Medicine Hat, have secured the contract to build a factory for the Canada Cement Co. two storeys high.

Brantford, Ont.—Damage amounting to $80,000 was done by fire on Oct. 19 to the factory of Thornton's, Ltd., hide, wool, and leather merchants. Mr. Thornton will rebuild.

Saskatoon, Sask.—M. L. Hovis, of Gibsonburg, Ohio, and W. R. Martin, of Medicine Hat, Alta., are prepared to place before the city council a proposal to drill a gas well within the city limits.

Edmonton, Alta.—The Alberta Legislature will be asked to vote $1,000,000 for erection of farmers' elevators in the province, $1,000,000 for telephone extensions, and $1,600,000 for public works.

Chelsea, Que.—The Canada Explosives Co., said to be a branch of the Nobel Co. of Europe, have started to build a plant here, but have been stopped by the Provincial Government owing to the proximity of Ottawa.

Berlin, Ont.—Owing to the increased demand for gas, the Light Commission will take steps to erect a new gas holder. The civic improvement expert has recommended that the entire plant be moved to the outskirts.

Caledonia, Ont.—Fire on October 11 destroyed a store house near the Grand Trunk tracks occupied by the Alabastine Co. and the Shirr Milling Co. Fifty thousand barrels of cement and machinery were practically a total loss, partially insured.

Wood-Working

Tilbury, Ont.—The Canadian Auto Top Co. contemplate the erection of a $20,000 plant.

Toronto, Ont.—Fire did $10,000 damage to the planing mill of Seoley Bros., 113 Ontario St., on October 15.

Ingersoll, Ont.—Evans Bros., makers of pianos, are preparing plans for doubling their factory, and will instal new equipment.

Yarrow, B.C.—J. H. Maddaugh is erecting a small shingle mill at Yarrow, Vedder Lake, B.C. The plant will use steam power.

Ottawa, Ont.—The planing mills of the Greater Ottawa Lumber Co. here were destroyed by fire Oct. 13, with a loss of about $60,000.

Verdun, Que.—Damage to the extent of $7,000 was done to the sash and door factory of C. E. Deschanaux on October 14. Insurance, $4,000.

Fort Qu'Appelle, Sask.—Geo. K. Grass of Sintaluta, is establishing a plant here for the manufacture of boats, accessories, and some lines of furniture.

Victoria, B.C.—The Cameron Lumber Co. has taken out a permit to erect a compressing plant on the Carbally Estate, Victoria. Estimated cost, $10,000.

L'Epiphanie, Que. — The Ferland Bros'. sash and door factory at L'Epiphanie, Que., was destroyed by fire. The loss is $25,000. The owners will rebuild.

Wardner, B.C.—The Crow's Nest Pass Lumber Co. is erecting a planing mill, replacing the one which was burned this summer. D. C. Patmore, Spokane, is architect.

Winnipeg, Man.—E. H. Briggs & Co., Ltd., manufacturers of brooms, etc., will increase their capital stock from $40,000 to $200,000, and add to the capacity of the plant.

Montreal, Que.—The sawmill belonging to the MacLaren Company, Bout De L'Isle, Que., was recently destroyed by fire at a loss of $50,000. The company will rebuild.

Stratford, Ont.—George Whitesides, Toronto, is starting a paper box factory here, and will spend from $20,000 to $25,000. A building has been secured and much machinery purchased.

Vancouver, B.C.—Foley, Welsh & Stewart, railroad contractors, will erect a sawmill 14 miles north of Newport, B.C. They contemplate building another mill in the Lillooet district, B.C.

Dane Creek, B.C.—The Upper Fraser Lumber Co., is erecting a lumber mill at Dane Creek, B.C., on the Fraser River. It will have a capacity of 100,000 ft. per day. A. H. Edwards is manager.

Bull River, B.C.—The Canadian Pacific Railway Co. is preparing to establish an extensive creosoting plant in connection with its lumber mill at Bull River, B.C. The water power at this point will also be developed.

New Incorporations

The United States Steel Products Co., incorporated at Toronto; capital $40,000, to trade in steel products and all other kinds of goods.

The Lake View Telephone Co., Ltd., incorporated in Nova Scotia to instal a telephone system from West Bay to Roberta. Peter Dunphy, president.

Niagara Brick & Tile Co., Ltd., incorporated at Toronto; capital $100,000, to manufacture brick, tile, stone, etc., at Niagara Falls, Ont. Incorporators: Francis W. Griffiths, Hartley F. Upper, etc., Niagara Falls.

The Electric Mfg. Co., of Canada, Ltd., incorporated at Ottawa; capital $2,000,000, to carry on the business of electrical and mechanical engineers, at Montreal. Incorporators: Howard S. Ross, Eugene R. Angers, etc., Montreal.

The Parsons Motor Car Co., of Canada, Ltd., incorporated at Toronto; capital, $500,000, to manufacture automobiles and motor vehicles, at Windsor, Ont. Incorporators: Alexander J. Denomy, Thomas G. Ellis, etc., Windsor.

The Richardson Scale Co., of Canada, Ltd., incorporated at Toronto: capital $50,000, to manufacture scales and machinery of all descriptions, at Bridgeburg, Ont. Incorporators: John A. Macintosh, Wilfred C. Marsh, etc., Toronto.

Merchants Mutual Lake Line, Ltd., incorporated at Ottawa: capital $1,500,000, to construct and operate ships, and generally to carry on the business of a shipbuilding, engineering, elevator business, at Toronto. Incorporators: James S. Lovell, Charles D. Magee, etc., Toronto.

Tenders

Vancouver, B.C.—Tenders will probably be called for the erection of viaducts over the C.N.R. tracks. The sale of city debentures will enable this work to proceed.

Toronto, Ont.—Tenders will be received by the Board of Control up to November 25th, for the supply and erection of structural steel work for the Gerrard Street Bridge, over the Don River.

Toronto, Ont.—Tenders will be received up to November 25th by the Board of Control, for the installation of one or more 7½ and 20 Million Imperial Gallon Pumping Engines, three Water Tube Boilers with Piping, and Coal Handling Apparatus at the High Level Pumping Station.

Toronto, Ont.—Tenders will be received up to November 18, for the supplying and laying of an 84-inch steel conduit from the Pure Water Reservoir on Toronto Island to the South Tunnel Shaft. Specifications and tender forms may be obtained upon application at the Department of Works, Room 10, City Hall, Toronto.

Ottawa, Ont.—Tenders will be received at the office of The Commissioners of the Transcontinental Railway until November 4, for the furnishing and installing of the Electric Wiring Systems required in connection with the equipment of the National Transcontinental Railway Car Shops at Transcona, Man., about six miles East of Winnipeg.

Plans may be seen and forms of tender and specifications obtained at the office of Mr. W. J. Press, Mechanical Engineer, Ottawa, Ont., and at the office of Mr. H. H. Pinch, Assistant Engineer, Transcona, Manitoba.

Water Works

Sydney, N.S.—The city is building an addition to its pumping station.

Sudbury, Ont.—The town will spend $5,000 on extension to water mains.

Chapleau, Ont.—The township will spend $5,000 for an extension to the water mains.

Toronto, Ont.—The city will erect a large sewage disposal works on the Don banks, costing about $2,000,000.

Tilbury, Ont.—The Michigan Central Railroad will build a large pumping station to supply the town with water.

Melfort, Sask.—The town has been authorized to spend $34,000 on waterworks and $16,000 for sewerage system.

Regina, Sask.—The addition of another filter bed to the sewage disposal works is contemplated by the city council. F. McArthur, city engineer.

Toronto, Ont.—Works Commissioner Harris, is preparing plans for a great sewer system for North Toronto, and districts East and West, to cost approximately $6,000,000.

Municipal

Kamloops, B.C.—The city is contemplating the erection of a gas plant at a cost of $75,000.

Verdun, Que.—The city council have raised $200,000, which will be spent on sewer extensions and paving.

Dundas, Ont.—The Mayor has been empowered to sign a contract for from 275 to 300 street lights of 100 watts, at $9.00 each.

Kingston, Ont.—On Nov. 3 the ratepayers will vote on a scheme to grant aid by bonus of $10,000 to Frank Vandersept Samwell, tube manufacturer.

St. Marys, Ont.—The by-law providing for a loan to the St. Marys Milling Co. for an addition to their plant, which was defeated, will be submitted again.

Guelph, Ont.—The Light and Heat Commission will purchase a complete gas heating outfit, and try it out in the gas and electric light building. If satisfactory they will be sold for use in private houses.

Vancouver, B.C.—Owing to the action of the British Columbia Railway Co. in increasing its fares, the Mayor has asked the company if it will be willing to dispose of the system to the city previous to 1919, when its franchise expires.

Maisonneuve, Que.—The city has applied to the Legislature for permission to build a police and fire station, and to equip with necessary fire apparatus. Agreements will be made with the interested companies for the burying of wires in certain streets.

Railways—Bridges

Ottawa, Ont.—The Ottawa Electric Railway Co. has prepared plans for a boiler and engine house to cost $12,000.

Hamilton, Ont.—The Board of Control will call for an estimate on an inclined railway at Sherman Ave., to be operated by the city.

Drummondville, Que.—Surveys are being made of the new St. Francis Valley Railway. Grading will commence this fall. C. B. Hibbard, vice-president.

Toronto, Ont.—On a bridge which the C.P.R. is planning in the Don Valley, the city has made provision for a driveway underneath, which will fit in with the proposed boulevard along the banks of the Don.

Guelph, Ont.—The Railway and Manufacturers' Committee of the City Council are considering making an application to the Government for power to build an electric railway along the right-of-way of the proposed Hydro-Electric transmission line to Elora and Fergus, and possibly to Arthur.

Sudbury, Ont.—The Sudbury, Kipawa and Bell River Railway Co. has given notice of application to Parliament for authority to construct a railway from Sudbury easterly to the south-end of Lake Timiskaming, and thence northeasterly to the National Transcontinental Railway at Bell River.

Contracts Awarded

Waterloo, Que.—The contract has been let by the council to Mackinnon & Holmes Co., Sherbrooke, Que., for a steel bridge in the Township of Shefford.

Toronto, Ont.—The Linde-Canadian Co., Front Street, Toronto, have been awarded the contract for refrigerating machinery for the new civic abattoir by the architects, Wm. R. Perrin & Co., Chicago. This consists of a 90-ton double acting ammonia compressor driven by a 140 h.p. motor, a liquid ammonia receiver, and a Linde double pipe ammonia condenser, expansion pipe for various rooms, etc.

Marine

Quebec, Que.—Messrs. M. P. and J. T. Davis, contractors for the new drydock at Levis, have signed the contract, and are now waiting for the Government engineer to lay out the work.

Vancouver, B.C.—The president of the White Pass and Yukon Railway announces a direct steamship service from Vancouver to Skagway, utilizing steamers costing $1,000,000.

Winnipeg, Man.—Winnipeg and St. Boniface harbor commissioners decided at a meeting held October 8 to ask the Dominion Government for $100,000 to build docks along the Red River. T. R. Veligny, Government engineer, will make a report on the actual cost of the work.

Trade Gossip

Homer & Wilson, machinists, toolmakers and metal stampers, have moved into their recently completed shop, 11-13 Lancaster Street, Hamilton, Ont.

The Hare Engineering Co. have moved from 14 King E. to 78 Duchess Street, Toronto, where in addition to convenient and commodious office quarters they will also have considerable warehouse and factory space.

John W. Peck, chief inspector of machinery for British Columbia, reports that there were no boiler explosions there in 1912. There were three fatal machine accidents, and these were not due to defects.

The Northern Motor Car Co., of Kingston, has gone into voluntary liquidation, as it finds it impossible to establish a business on a paying basis within a reasonable period. The nominal capital of the company is $1,000,000, of which $85,000 has been subscribed, but only $46,400 has been paid up. The liabilities are stated to be $10,000.

Albert Skinner is in Canada representing the following Sheffield firms:—Richard W. Carr & Co., steel, file and tool manufacturers; Fox Bros., Delhi Works; Bennett Farren & Co., Ltd., Devonshire Engineering Works, makers of power hammers, lathes, shovel rolls, etc. His headquarters in Montreal are at 419 St. Urbain Street.

Rae Bros., Merrick St., Hamilton, Ont., manufacturers of grinders, clutches, air compressors, and special machinery, have built a machine for making and printing brown paper bags, to the order of the Standard Chemical, Iron & Lumber Co., of Montreal. They have also recently built a spool winder for the B. Greening Wire Co., Hamilton.

The Rudel-Belnap Machinery Co., Canadian Express Building, Montreal, will in the near future open an office in Toronto. The Toronto branch will be in charge of A. E. Juhler, who is well known in machinery circles on account of his long connection with the London Machine Tool Co., and more recently as Toronto manager for the General Supply Co. of Canada. The lines handled in Toronto will be principally standard machine shop equipment, pumping machinery, etc.

The Smart-Turner Machine Co., Ltd., Hamilton, Ont., have recently secured the following orders: The Canada Ice Machine Co., Fort Qu'Appelle, Sask., one Duplex Power Pump; Geo. Gordon & Co., Cache Bay, Ont., Duplex Pump; The Institute for the Blind, Brantford, Ont., one Vacuum Pump; The Otis-Fensom Elevator Co., Toronto, one Underwriter Fire Pump; Mr. F. L. Snively, Dunnville, Ont., one Duplex Pump; The Harbor Commissioners of Montreal, Que., one Simplex Power Pump; The Dominion Canners, Ltd., Burlington, Ont., one Duplex Pump; The London Cold Storage & Warehouse Co., London, Ont., one Duplex Power Pump.

Personal

W. S. Harvey has been appointed city engineer of Lethbridge, Alta.

T. P. Mason, managing director of Shaw & Mason, metal workers, etc., Sydney, N.S., is dead.

A. F. Mack, of the United States Steel Products Co., Montclair, N.J., was in Vancouver last week on a pleasure trip.

Canadian Vickers Limited Shipbuilding Plant at Montreal

"By Maisonneuve"

A perusal of the accompanying article cannot fail to impress the reader with the far-reaching nature of the plans made to establish in our Canadian Metropolis a merchant and naval shipbuilding and marine engineering plant, and while the development towards compassing the achievement aimed at, will of necessity be a matter of years, there is unmistakable indication that climatic and labor difficulties, which meantime have to be combatted, will ultimately be overcome.

AN inspection of the new Canadian Naval Works at Maisonneuve on the Banks of the St. Lawrence at Montreal presents to the eye an instructive spectacle and to the mind subject for inspiring reflection. We have time and again been asked to believe, against our better judgment, that the building of warships in Canada is an economical, if not physical, impossibility. The works, which are developing into material form, contradict all such prognostications, and reflection on the significance of the addition of such an establishment to Canadian resources opens up a vista of potentialities too vast to be accurately measured.

Stability of the Enterprise.

The project materializing is not the conception of an inexperienced speculative mind, but is the embodiment of great and ripe experience. In their estimate of the possibilities of the project, in the arrangement and equipment of the works, and in the design, construction and completion for service of ships to be built in the establishment, the projectors have the operation and technical assistance of the greatest naval firm in Great Britain that of Vickers Limited.

In the past five or six years, the Vickers Company have been responsible for the construction of thirteen of the world's largest "Dreadnoughts"—apart altogether from their contributions in armour, ordnance and propelling machinery for other battleships—and of a great variety of smaller warships. Their support and guarantee of the immense establishment now being created on the St. Lawrence must, therefore, rule out of court all predictions as to the difficulty of achieving complete success in the building of warships and merchantmen in the Dominion.

The Economic Feature.

The conditions in Canada, are no more severe than, for instance, those obtaining in Russia, where for years satisfactory work has been done. As regards industrial economics, again Canada is not worse off, and perhaps we are better off than our neighbors, the United States, where the enormous advances made in the development of mechanical appliances for economizing labor have robbed the bugbear of "high rate of wage" of much of its significance.

It is more and more being recognized that a high rate of wage may become an advantage from the economical point of view, because it so greatly stimulates improvement in mechanical appliances. Therefore, the fact that in the equipment of the new works at Montreal, the experience of such a firm as Vickers will be available in determining the character and design of all machinery to facilitate production, justifies full hope that the results will be eminently satisfactory from this standpoint.

The Canadian Navy Feature.

There is no question that before many years have passed, Canada will produce warships as well as commercial ships, equal to those of any other nation, to take their place in the fleets of the world, and to give as good a report of themselves as the ships of the oldest and most prosperous of commercial countries. All in the Dominion recognize the need for defence. Most of us are convinced too, that Canadian ships should ever be at the call of the Homeland in her hour of need, while no one will fail to agree to assist in the maintenance of the Imperial Navy.

There is, at the same time, however, a great and justifiable ambition to create an industry in Canada for the building of war and merchant ships, and to place such an industry upon a sound commercial basis. The question, therefore, arises as to whether these two ideas should not be brought into close relationship with each other, so that, at no far distant date, Canada may be able to take her share in the building of the Imperial Navy. Thus, whilst spending money on the navy there would, at the same time, be fostered and perfected commercially a great industry, which would be an abiding advantage to the nation.

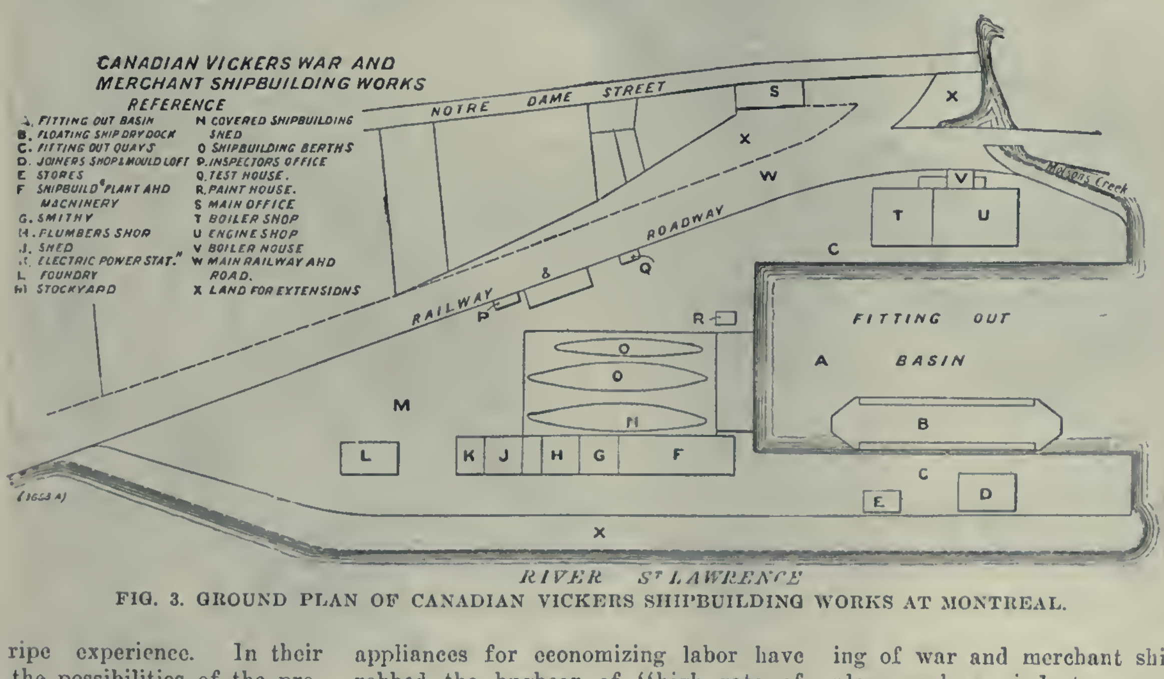


FIG. 3. GROUND PLAN OF CANADIAN VICKERS SHIPBUILDING WORKS AT MONTREAL.

To realize the benefit of such procedure, one has only to reflect upon the enormous gain to the resources of the Mother Country of the privately owned warship building establishments, which have grown up within the present generation by reason of the patronage of the British Admiralty. These naval establishments are to-day a great source of wealth to the Mother Country, not only because of the warships built for His Majesty's Navy, but also because of the many vessels constructed for foreign fleets.

The guarantors of the Montreal Naval Works hold such a place in the naval construction history of the world, that every confidence may be reposed in them, and the belief accepted that the money which may thus be spent on the banks of the St. Lawrence will give as economical results as the same money spent in the Homeland.

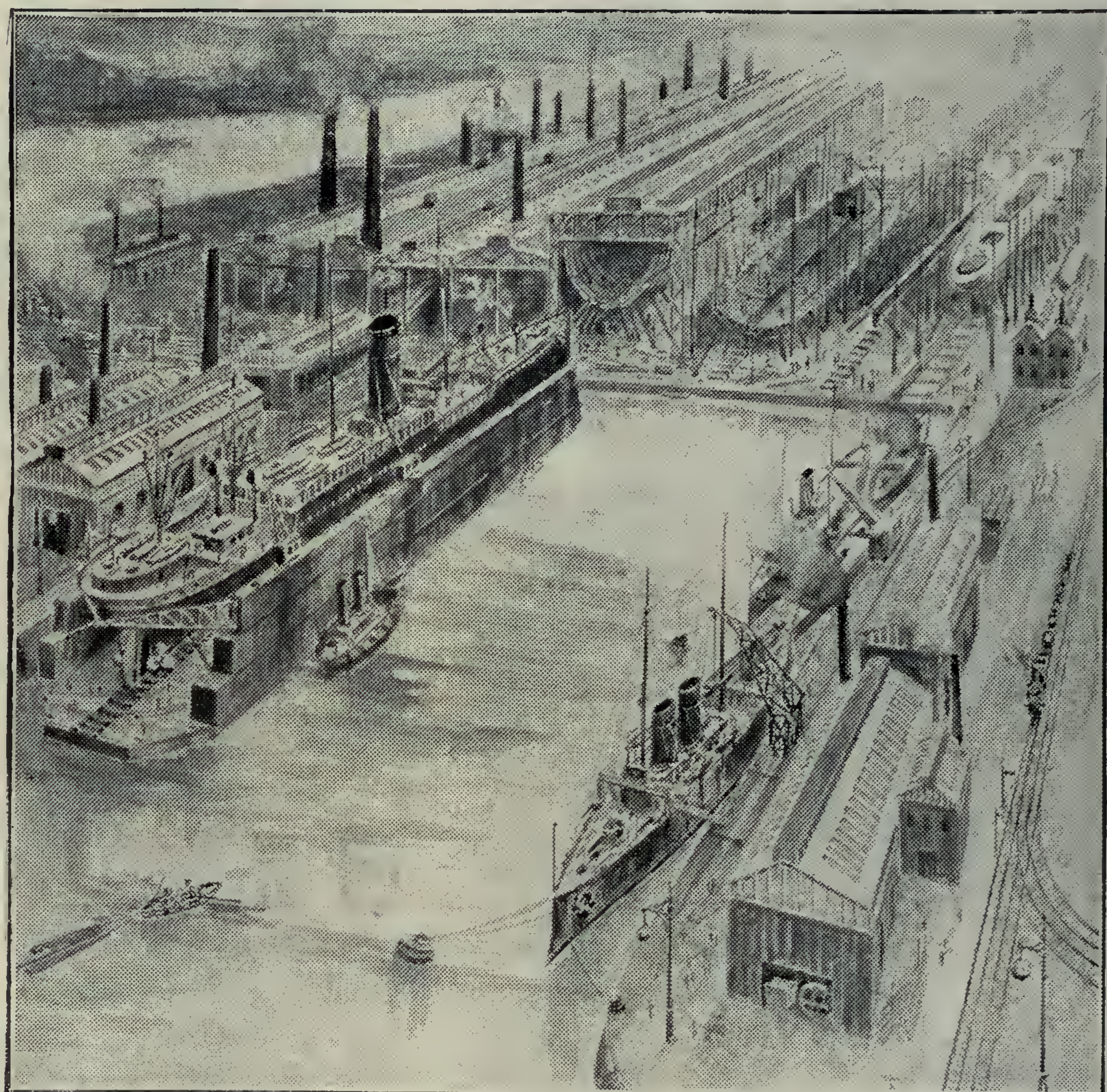


FIG. 4. BIRD'S-EYE VIEW OF CANADIAN VICKERS' SHIPBUILDING WORKS AS THEY WILL APPEAR WHEN COMPLETED.

Development of Auxiliary Industries.

The full possibilities of the situation are not, however, measured alone by the building up of the shipbuilding industry in Canada. There are many incidental industries, which will be nurtured by the establishment of shipbuilding. These are almost innumerable, and of such a nature as would in the end enable Canadian labor largely to supply Canadian demands, apart altogether from the necessities of the maritime trades. This is a point which cannot be too forcibly urged. Statesmen recognize that no Nation can become truly wealthy which depends exclusively on natural products, whether they be agricultural or mineral. The Americans, like the nations of the Eastern hemisphere, have fully grasped this economic law, and the aim in Canada ought to be to protect and cultivate those manufacturing industries which yield a greater degree of wealth than the products of the soil, as a supplement and support to the latter.

Decadence of Canadian Shipping.

Has Canada in recent years advanced sufficiently along the line of greatest possibility in this respect? If the case of the maritime trades alone be considered, it is unsatisfactory to discover how small a part is played by Canadian owned ships. Ere yet steam displaced the "unbought wind" in the propulsion of ships, and before steel supplanted timber as the constructive material for vessels, Canadian ships played a prominent part in the transport of goods, the tonnage even as late as 1883 being nearly double that of the vessels owned to-day. In five years, there has been only an increase of 9,000 tons in the tonnage of the shipping registered in Canada, so that there is a call for the building up of a bigger Canadian merchant fleet worthy of the Dominion.

Similarly in the metal industries, there is room for great expansion. The steel bounties, which date only from nine years ago, have had the effect of considerably increasing the making of steel, but further stimulating influences are required. This, an important phase of the question should have full consideration in settling the ultimate policy of our statesmen in regard to our participation in naval defence and the assistance we should render to the Imperial Forces. Shipbuilding works established on the western seaboard, as well as on the eastern, while creating a new industry of far-reaching importance and stimulating other branches of mechanical activity, would give employment to vast bodies of workers, provide means of overhauling and repairing the ships required for naval defence, develop the owning and building of merchant shipping, and generally increase the wealth of the Dominion.

Montreal's Floating Drydock.

Already the Battleship-Floating Dock associated with the new establishment at Montreal, and appropriately named "The Duke of Connaught" by Royal permission, has done splendid work. Of its capacity, there is no need to write at length, in view of the fact that some of the largest ships trading on the St. Lawrence have already been berthed upon it and have undergone extensive repair. The largest of warships can easily be accommodated because the width between the walls is 100 feet and there is practically no limit to the length of vessels which may be dealt with. Moreover, by characteristic prescience, the management decided to have a dock, which could be separated lengthwise, into three complete parts, so that one or two or all of the sections may be utilized according to the size of the ship to be docked. Thus, it is possible to dock independently and simultaneously three of the vessels engaged in the internal navigation of the Dominion.

Fig. 1 shows the "Montreal," a typical Canadian vessel entering two sections of the dock, which have been sunk by the admission of water into the double bottoms, while the third section is seen separately awaiting another ship.

Fig. 2 shows the "Lake Manitoba," one of the largest of the C. P. R. ocean fleet, undergoing repair within the dock. The "Lake Manitoba" has a length of 470 feet, a beam of 56¼ feet, and a tonnage of 9,674 tons.

Plant Extent and Equipment.

The establishment at Montreal as it appears to-day covers about 45 acres. Men are now busy completing the ship fitting-out basin—12 acres in extent—in which is accommodated the floating dock; the depth of water being 50 feet. The foundations are being put in for the berths at the head of this basin for the construction of ships of the largest size, and these will be launched into the basin. Buildings are being erected to accommodate complete installations of machine tools for the construction of ships, engines, boilers and all marine auxiliaries. There are also being formed now the concrete foundations, on which the heavy machine tools will be placed.

In the basin, and in the channel forming the exit into the St. Lawrence, there are at work several of the dredges of the Montreal Harbor Commission and of the Government Department, both of whom have heartily seconded the efforts of the promoters towards the realization of this scheme of first-class national importance. Only a few months ago, the site now marked out by the basin walls and the foundations for the machine shops was a small creek or was bedded in the foreshore of the St. Lawrence, much of the land having been reclaimed from the river which is here a mile wide.

Ship Fitting-Out Arrangements.

Fig. 3, and the bird's eye view Fig. 4, show the works as they will appear when completed. A prominent feature is the ship fitting-out basin formed by two concrete walls almost parallel with the St. Lawrence. At the head of this basin are the shipbuilding berths, now being constructed. These are to be entirely covered in, and are being arranged to take vessels up to 1,000 feet in length, and of proportionate beam. The advantage of covering in the berths is that work may proceed under all weather conditions. The crane arrangement, too, will be such that considerable

FIG. 1. R. & O. RIVER STEAMSHIP "MONTREAL" ENTERING TWO SECTIONS OF THE FLOATING DRYDOCK.

weights can be lifted on board, prior to the launch.

As is well known, some new ships built in the Old Country are launched merely as shells with the minimum of work upon them, while others are in a much more advanced condition, all the boilers and many of the auxiliary engines being fitted on board. The provisions made in the Montreal establishment will enable either the minimum or maximum of work to be done before the vessel is floated, so that the actual date of launching the ship may be advanced or retarded to suit conditions without interfering with the pre-arranged date of completion.

Ship Construction Equipment.

The buildings for the accommodation of the ship construction machinery are being erected between the building berths and the river, while those for the construction of the propelling engines and boilers are on the landward side of the building berths. The construction of these buildings is in progress, and they are of the latest design approved in the shipbuilding world. The equipment of machine tools will be as complete as in any British yard, and each will be supplied by the best maker of its respective types.

All the machines will be independently driven by electric motors, and each of the largest will have a crane fitted for the manipulation of plates and angles. Plates up to 40 feet in length, 8 feet in width and 2 inches in thickness are being provided for in the machine capacity. There is being built an independent department for dealing with angles and beams, and, as in the plater's shed, the furnaces will be operated by gas generated in producers and conveyed to the furnaces, as well as to the black-

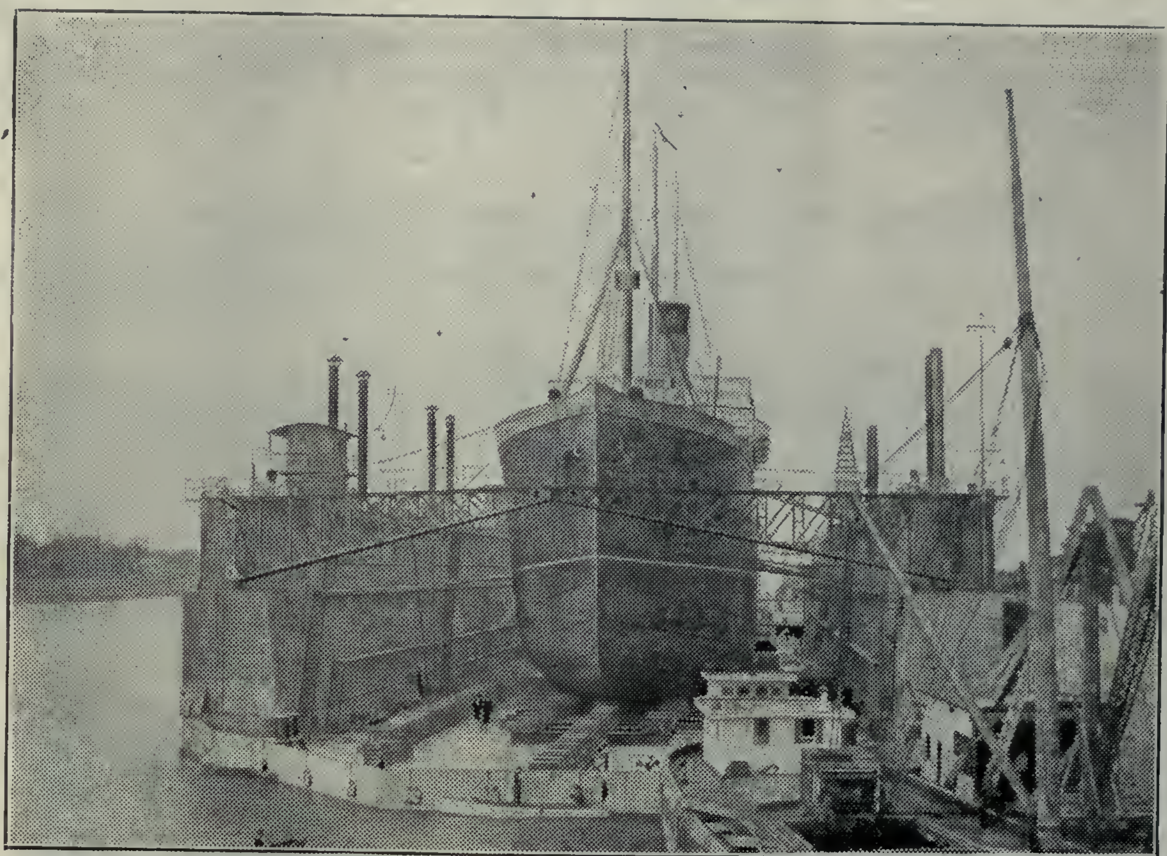


FIG. 2. C.P.R. ATLANTIC STEAMSHIP "LAKE MANITOBA" UNDERGOING REPAIRS IN FLOATING DRYDOCK.

PANORAMIC VIEW OF THE SHIPBUILDING SLIPS AND FITTING-OUT BASIN OF THE CANADIAN VICKERS CO., LTD., AT M
DREDGED OUT FROM THE BASIN. WHERE THE VARIOUS BUILDINGS ARE TO BE ERECTED, THE GROUND IS BEING P
BE ENTIRELY UNDER COVER, THUS ENABLING WORK TO BE CARRIED ON IN ALL WEATHERS. E. G. M. CAPE IS THE GEN

smith's fires, in underground conduits.

The blacksmith's shop will contain several steam hammers, each equipped with an electric crane. There will also be in this department a large forge, having alongside a separate furnace. An annealing furnace will also be installed.

Ship Equipment Production.

Independent buildings are being erected for the accommodation of plumbers, sheet iron workers, copper-smiths, wire-workers, tinsmiths, electricians, and other tradesmen, the aim being to carry out practically all work in connection with the building of all types of ships. The joiners, carpenters and others connected with wood work are to be accommodated in a separate building of two stories. On the ground floor, there will be a comprehensive collection of the latest design of machinery and, according to the best practice, all these machines will be driven by electrical motors placed under the floor level. The upper floor will be for hand work only.

Accommodation is also being provided in the same building for the moulding of the ship's frames, etc. There are also riggers' and sail-makers' lofts, having, as in all departments, complete mechanical appliances for ensuring the greatest volume of production for a given amount of labor and supervision.

Propelling Machinery Production.

The building for the construction of propelling machinery will be as complete as any yet devised in any country. The machinery will be designed and built according to the latest experience for the manufacture and repair of all classes of marine and other engines, including steam reciprocating and turbine machinery, oil engines, such as may be fitted to sub-marine as well as surface craft and all auxiliaries connected with ships. In the engine erecting shop which is of specially large ground area there will be installed overhead cranes to lift loads ranging up to practically 100 tons.

Some idea of the magnitude of the work which it is proposed to undertake may be formed from the size of some of the more notable tools. There will be a horizontal machine capable of boring 12 feet diameter by 35 feet long; a lathe capable of taking a turbine 40 feet long; an 8 ft. chuck lathe with two compound slide rests; lathes for shafts up to 24 in. diameter, and 80 ft. long; in addition to correspondingly large milling, shaping, slotting and wheel-cutting machines, saws, grinders, etc. These and other machines will be utilized for the manufacture of guns. There will also be a complete installation of small machine tools for brass finishing and light work, etc.

Boiler Shop and Foundry.

In the boiler shop, which is to be a continuation of the engine factory, of the same dimensions, and equipped with equally powerful cranes, there will be every tool which extensive experience has shown to be efficient for the construction of all types of boilers.

Large foundries for iron, steel and brass, are being arranged, so that the

CANADIAN PACIFIC S. S. "MOUNT TEMPLE" IN FLOATING DRYDOCK "DUKE OF CONNAUGHT," IN MONTREAL. OCTOBER 9, 1913.

E, MONTREAL. MOST OF THE LAND COMPRISING THE SITE CONSISTS OF MADE GROUND, SOME OF IT BEING SPOIL
(ABOUT 2,000 McARTHUR CONCRETE PILES, 16 INCHES IN DIAMETER BY 30 FEET LONG. THE SHIPBUILDING SLIPS WILL
TRACTOR, THE PILING CONTRACT HAVING BEEN SUB-LET TO THE McARTHUR CONCRETE PILING CO., NEW YORK.

firm will be able to produce their own castings, and make it, in this respect, independent of outside sources for these.

All machine tools in all departments will be electrically driven. The electric power will be taken from one of the local supply Power Companies of Montreal at a pressure of 10,000 volts, and in the plant there will be a central station with three large rotary converters for transforming the current to suit the operation of the various machines, and for lighting the works. An hydraulic accumulator actuated by electrically driven pumps to give a working pressure of 1,500 lbs. per square inch will also be installed, while in connection with the working of pneumatic tools, there will be two air compressors.

Test House and Laboratory.

Every precaution is being taken to maintain as high a reputation in the Dominion as Vickers have achieved in Britain, and for this purpose, there is to be included a well equipped test house and laboratory, containing all the latest appliances. In this department, there will be tested all construction materials, in order to eliminate as far as is possible all defects. It may be added that in arranging the plan of the works, provision has been made so that each building can be extended, and new shops laid down without interfering with the general scheme.

From first to last, the establishment, promises to be as satisfactory and complete for the building of all types of ships for the Navy and Merchant Service as any in the world, and from this point of view the advent of the Canadian Vickers Ltd. on the St. Lawrence will, as already indicated, open up great possibilities for future developments, particularly as there will be brought to bear in this connection, not only full guarantees for success, but the professional ability, experience and resource of a firm unexcelled in this particular department of applied science.

S.S. "MOUNT TEMPLE" REPAIR.

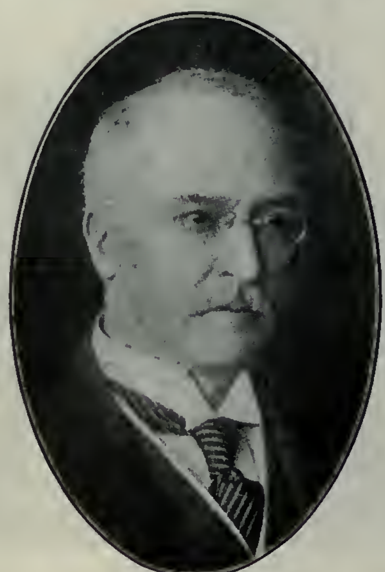
ONE of the biggest jobs so far undertaken by the Canadian Vickers Company was that involving the repair of the C.P.R. liner Mount Temple. This vessel left Montreal for Antwerp at dawn on September 24th last, with a grain cargo of 120,000 bushels. When opposite Longueuil, she got out of her course and ran aground on a mud bank, doing considerable damage to her bottom. Attempts were promptly made by tugs to pull her off, but without avail, and the vessel remained aground until September 26th, by which time sufficient of her cargo had been discharged into lighters to enable her to be floated. She then returned to her berth under her own steam, and at once commenced to discharge the balance of her cargo of grain. This proved a tedious business, owing to the lack of mechanical unloaders constructed to enter a hold as deep as that of the Mount Temple, consequently it was not until Sunday, October 5, that the vessel was towed down to Maisonneuve to enter the "Duke of Connaught" floating dry dock. She entered the dock at 12.50 p.m. and was centred by 1.10 p.m.; the powerful pumps of the dock being started at 1.15 p.m. Fifteen minutes later the liner's keel touched the blocks and by 3.45 p.m. the dock was dry.

An examination was at once made and revealed the fact that the liner had sustained considerable damage. Several plates forward and some amidships had been dented and pierced, and from the gaping seams, stones, some of which were nearly as large as a man's head, were pulled out, showing that when the ship struck the mudbank, or, as her officers claim, before she did so, she struck something very much harder than mere mud.

The Canadian Vickers Co. put every available man to work carrying out the repairs as soon as the official survey of the ship's injuries had been made by Captain Reid, port warden. Work was carried on day and night, and by Friday night, October 10, the damage had been made good. However, the Mount Temple was not undocked until mid-day on Sunday, October 12, owing, it is understood, to the company having been requested to carry out some further work on the hull which it was considered advisable to attend to while a good opportunity offered. The repairs effected were of such a nature as to enable the vessel to cross the Atlantic with a full cargo, and, on leaving the dock, she at once returned to her berth and commenced loading up again with grain and deals.

The fact that the Canadian Vickers Co. were able to handle this job, even though their plant is as yet far from being completed, has caused great satisfaction in shipping circles and amongst business men generally, the important part which this large firm is destined to play in the marine development of the Dominion being fully realized and appreciated.

DR RUDOLPH DIESEL.



DR. RUDOLPH DIESEL.

DR. RUDOLPH DIESEL, whose disappearance was chronicled recently, was born in Paris in 1858, and although of German parentage, commenced his education in France. At the age of 13, he was sent to Augsburg and later to Munich. After serving for some time as assistant to Prof. von Linde, he spent a short time in practical work in Winterthur with Sulzer Bros., and was afterwards appointed Manager of the Paris firm for the manufacture of the Von Linde refrigerating machinery.

Ever since his early days at Augsburg and Munich, his main ambition, possibly an obsession, was to discover a prime mover with a much higher thermal efficiency than the steam engine. He designed an engine, and, in 1893, Messrs. Krupp and the Augsburg-Nuremberg Co. gave him financial assistance for its construction on the lines he had designed. This was a failure, indeed it exploded and nearly killed Dr. Diesel, but it showed at any rate that pure air could be compressed to such a degree that it would ignite oil fuel. A second engine was more of a success, but was not reliable, and was, moreover, attended with much danger in the working, but after several experiments with it, another was constructed by the Augsburg Company in 1897, and this proved to be successful.

Since then, many improvements have been effected. The first Diesel engine installed in a ship was built in 1903 by Adrien Bochet and Frederic Dyckhoff, this being of 20 h.p. and having two pistons working in opposite directions in one cylinder on the 4-stroke cycle. The patents for Great Britain are owned by the Diesel Engine Co., which is now merged into the Consolidated Engine Manufacturers, Ltd.

The circumstances of the tragic disappearance of this great inventor are too well known to be reiterated, but if it be true that he is lost to us for ever —and we are reluctantly compelled to admit the great probability—the world has been deprived of a great inventor whose perseverance and tenacity of purpose won for him the admiration of all who know the story of his early failures.—S. & S. Record.

Steam Boiler Explosion at City Gas Plant, Oshawa, Ont.

Some time ago we were asked why we did not publish editorial matter dealing with boiler explosions in Canada, and, in reply, had to make confession that it was entirely on account of the paucity of such occurrences. An opportunity is now afforded us, yet we trust that the explosion interval may continue to expand, thereby adding fresh laurels to our manufacturing ability, our operative care, and our inspection thoroughness.

ON Friday morning, September 12th, there occurred a disastrous boiler explosion in the plant of the City Gas Company, Oshawa, Ont., from which two men lost their lives, and considerable damage was done to the gas plant and buildings generally.

FIG. 1. TOP HALF OF BOILER SHELL BLOWN A DISTANCE OF 350 FEET.

The boiler referred to was of the return tubular type, 44 in. dia. by 11 ft. 6 in. long, and contained 40 3 in. tubes. The shell was made up of three courses of 1/4 in. plate. The centre course consisted of four pieces, as seen from the photos, and the heads were 5-16 in. thick. The circumferential and longitudinal seams were lap and single riveted, using 5/8 in. rivets pitched 2 in. centres. Each head was braced by 3 diagonal stays made of iron and welded.

The stays were attached to the heads by double crow feet 3 in. x 1/2 in., and were secured to the head by 4 5/8 in. rivets. The palm of stays, 2 in. x 1/2 in., were secured to shell by 2 5/8 in. rivets.

The boiler was supported on brickwork by two cast iron brackets on each side, which were attached to shell by 6 5/8 in. cap screws, with nuts on the inside. The front head of boiler was made up of four pieces, as seen from the photos.

The dome was 21 in. dia., 31 in. high, and the head was secured to sides by 3 3/4 in. stays. The neutral part under dome was cut away the full size of the latter.

History and Characteristics.

As to the history and characteristics of the exploded boiler, investigation went to show that it was forty years old, and had been in service in the gas plant about six years, being a second-hand boiler when installed. An examination of the exploded boiler showed cracks in many places. The plates were torn, and the joint left intact. The plates were badly laminated and crystallized, and, in fact, appeared to be completely worn out.

Coroner's Jury Finding.

(1)—That the deceased came to their death, caused by an explosion of a steam boiler, on September 12th, 1913, while at work on the premises and in the employ of the Oshawa City Gas Co., in Oshawa, Ont.

(2)—We are unable to say what caused the explosion, but from the evidence it appears that the water in the boiler was allowed to get too low at times, and that the boiler was subjected to extreme pressure.

(3)—We also believe that the man in charge had insufficient experience in the care of steam boilers.

(4)—We also believe there should be a better system of boiler inspection by thoroughly competent Government inspectors for all stationary boilers under the management of competent men when human life is at stake.

(5)—We also find from the evidence produced that the boiler, in our judgment, was old, unsafe, and unfit for the

FIG. 2. REAR HEAD AND DOME OF EXPLODED BOILER.

pressure and work for which it was employed.

Photo No. 1 shows the top half of shell, which was blown over the building and landed about 350 feet away. Note the elongated hole in sheet where the lug was blown out, also the number of pieces in centre course in shell. The lug blown out can be seen on ground in front of

FIG. 3. FRONT HEAD OF EXPLODED BOILER.

shell plates. The man standing to the left is D. M. Medcalf, Chief Inspector of Steam Boilers for the Province of Ontario, while the third man from left is T. J. Main, one of the Provincial Inspectors.

Photo No. 2 shows the rear head and dome of exploded boiler. Note the tubes ends in tube sheet, where they separated at the welds.

Photo No. 3 shows the front head. Note the repairs that had been made. and the manner in which the head had been blown to pieces.

Photo No. 4 shows the inside of the plates over the fire. Note the cracks on longitudinal seams.

BOILER BAGGING.

THE majority of the reported cases of boiler bagging are due to the presence of scale or oil in the boiler, states a writer in the "Power User." The removal of the former may be accomplished by what has been termed the "periodically clean" method—that is to say, by the use of mechanical cleaning methods each time the boiler is opened up for inspection, by the introduction of boiler compounds, or by treating the feed water chemically.

No amount of chemical treatment will remove oil from feed water, however, and some mechanical filtering process must be relied upon for its elimination. Some engineers favour cloth filters and some sawdust, sand or other substances; but most depends upon the design of the filter itself, and individual manufacturers of these apparatus may be relied upon to adopt the filtering medium which is best suited to their own construction.

With regard to the comparative harmful properties of various oils, the most dangerous bags and blisters are generally caused by animal and vegetable compounds, with or without the additional presence of scale. Attempts to boil them out with soda or some alkali are to be severely condemned as rendering the oils more dangerous still.

SCOWS FOR QUEBEC HARBOR COMMISSION.

THE Quebec Harbor Commission are having built at the Polson Iron Works, Toronto, six steel dump scows; three with a capacity of 500 cubic yards, and three with a capacity of 300 cubic yards. They will be built entirely of steel, with square bilges; the hull plating being connected by steel castings. The overall dimensions of the 500 yard scows are 144 feet long by 31 feet wide by 11 ft. 6 inches in depth. The 300 yards scows are 108 feet long by 28 feet wide by 11 feet deep.

The hoppers are divided into pockets, and the sides have water-tight compartments formed by transverse bulkheads. In the 500 yard scows, the hoppers are divided into 7 pockets, each being 16 ft. long by 9 ft. 3 in. deep by 21 ft. wide at the deck. They have, on each side, 9 w.t. compartments with 7 bulkheads. The 300 yard scows have 5 pockets, each 16 ft. long by 8 ft. 6 in. deep by 19 ft. wide at deck. They have on each side 7 w.t. compartments with 5 bulkheads. In all cases the depth from pocket combing to deck is 2 feet with a deck chamber of 6 inches. In the 500 yard scows the discharge doors in each pocket are operated by a steam driven worm gear, while the 300 yard scows are equipped with a hand operated worm gear.

FIG. 4. INSIDE OF PLATES OVER FIRE ON EXPLODED BOILER.

Drill Jig and Fixture Design and Construction

By H. R.

The sketches and data will, the writer hopes, appeal to machine shop superintendents, designers, toolmakers, and novices, as indicating the large place jigs of every kind and for every service occupy to-day in machine shop practice.

IN all cases drill jigs should be provided with legs or feet on the sides opposite the bushings, or some other means provided of squaring up the jig on the table of the machine so that it will be vertical with the tools. The manufacture of the jig is also greatly facilitated by the addition of these feet, as it is much easier to lay out and plane the surfaces. Where no feet are required, it is a great advantage to the tool maker to have small lugs cast on to the sides of a jig when it is of cast iron; they provide good bearing surfaces when laying out for machining. It is usual to provide jigs with four feet, but in some cases it is sufficient to have only three. Care should be taken that in each case all the bushings and places where pressure will be applied are placed inside of the geometrical figure. This is obtained by connecting with lines the points of location for the feet.

While it may seem that three feet will be sufficient, it being obvious that the jig will obtain a bearing on all of them, it is hardly safe to use only three supports, because chips are liable to get under the feet and throw the jig out of line without being noticed by the operator. If the same thing happen to a jig with four feet, it will rock about and the operator will at once detect the trouble. Again, if the table is out of truth, this will also be noticed at once.

There are several ways of making jig feet, the most common being to cast them solid with the jig in the case of cast jigs, while for built up jigs, the legs are generally screwed into the piece. These are illustrated by Fig. 132, which depicts the feet cast on.

Fig. 133 shows facing pieces, which act as feet as well as points for marking off, etc., in the manufacture of the jig.

Fig. 134 shows legs that are turned off from the bar and screwed up to a shoulder.

Fig. 135 illustrates a type that are riveted into the jig. The legs are usually made of cold rolled steel hardened and ground on the bottom so that all the legs or feet are the same length.

Fig. 136 shows what is termed an inserted pin. A stock of these is usually kept so that they can be used for locating or supporting work as well as acting as feet.

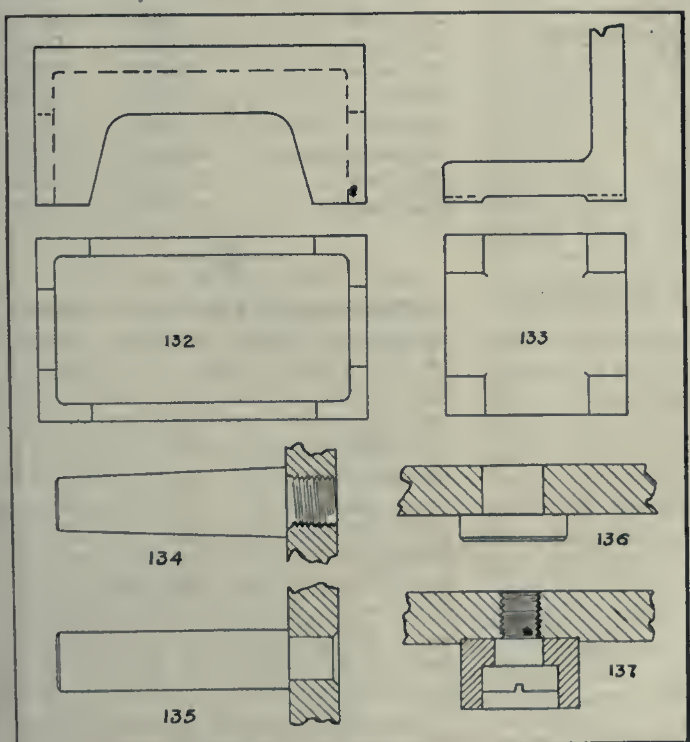
Fig. 137 shows another good idea for jig feet, which will save machining strips and can be fitted as the toolmaker thinks best. These can be also carried in stock to advantage.

There are many ways of locating a piece in a jig. This is usually accomplished by means of finished pads cast on the jig, bosses, seats, lugs, etc. An idea of these may be gathered by the illustration, Fig. 138. In this the locating points are marked (F). These bring the piece to be operated upon in the right relation with the bushings for the drills, or to the gauges to which the other tools may have to be set. This method of location is very satisfactory when the work is finished in a uniform way, also when the variation in the components is very slight.

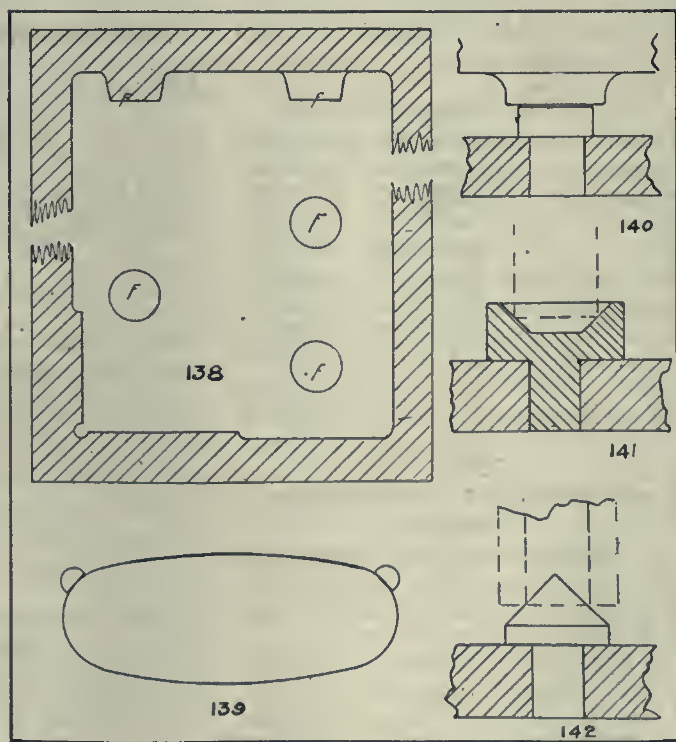
Another way of locating work is by dowel pins, as shown in Fig. 139. The sides of the pins which locate the pieces are usually flattened by a file, and adjusted to suit the pieces to be machined. This procedure also prevents too rapid wear on the locating pins, as would be the case if the work bears against the pins along a line only.

Very often pins and studs are inserted in jigs to act as locating points instead of having lugs cast directly on the jig, as shown in Fig. 138. A case where a pin is used for this purpose is shown in Fig. 140, where the body of the jig has the pin inserted to act as a locating and resting point, and the work located against the face of the pin. Locating pins of this type should always be provided with a collar or shoulder, to take all the pressure of the work they support, without any possibility of moving in the hole into which they are inserted.

When it is essential that a cylindrical part of the work be located centrally either with the outside of a cylindrical



DRILL JIG AND FIXTURE DESIGN AND CONSTRUCTION.



DRILL JIG AND FIXTURE DESIGN AND CONSTRUCTION.

surface or with the centre of a hole passing through the work, good locating designs are provided by Figs. 141 and 142. In Fig. 141 the inside conical locating piece is of cold rolled steel, and may serve as a drill bushing, as shown in a former article.

Fig 142 shows a stud turned conically so as to enter the hole of the work. These two locating pieces are always made stationary and are only used for locating the work and not for binding purposes or clamping.

SEPTEMBER FIRE LOSSES.

THE fire loss of the United States and Canada for September, 1913, as compiled by the New York Journal of Commerce, shows a total of $17,919,300. These figures show an increase of more than $4,000,000 over the record for September of last year and $6,500,000 over the same month of 1911.

The following table gives a comparison of the losses by fire during the first nine months of this year, together with the same time in 1912 and 1911, also the losses by months for the balance of those years:—

	1912.	1913.
January	$35,653,150	$20,193,250
February	28,601,650	22,084,600
March	16,650,850	17,511,000
April	16,349,400	16,738,250
May	21,013,950	17,225,850
June	16,103,450	24,942,700
July	15,219,100	20,060,900
August	14,158,800	21,180,700
September	13,779,300	17,919,300
Total 9 mos.	$177,429,650	$178,456,550

BIG INCREASE IN CANADIAN EXPORTS.

A STRIKING feature in the Statement of the Trade of Canada for the month of September, issued by Hon. J. D. Reid, Minister of Customs, on October 23, is the decrease of imports and the increase of exports.

Dutiable goods to the value of $37,997,000 and free goods to the amount of $16,342,000 were imported during September last. The imports for the corresponding month of 1912 were $38,548,000 dutiable goods, and $19,307,000 of free goods.

Exports for last September were $37,048,000 of domestic goods and $4,071,000 of foreign goods, as against $25,814,000 domestic and $3,153,000 foreign for September, 1912.

The total exports for the six months ending September 30th last were, all of domestic goods, $188,405,000, and foreign goods, $22,842,000, as against $162,427,000 of domestic and $15,972,000 foreign for the six months ending September 30th, 1912.

The exports of agricultural produce show a big increase, being $11,829,000 for September, 1913, compared with $5,575,000 for September, 1912. There are big increases in exports all along the line. Exports of minerals for September last were $6,402,000, and for the previous September, $5,278,000. Exports of manufactures also show an increase, being $5,041,000 for September, 1913, as against $3,587,000 for September, 1912.

Canadian trade was never in a more prosperous condition, as the total Canadian trade for September last was close upon one hundred millions, the actual figures being $95,665,000, compared with $87,606,000 for September, 1912. For the first six months of the present fiscal year ending September 30th last, the total Canadian trade was $551,978,000, compared with $506,265,000 for the corresponding six months of the fiscal year 1912.

TO PREVENT ACCIDENTS.

DON'T use tools or appliances, nor touch machinery or belts, until you have been fully instructed as to their proper use and care.

Don't move a locomotive without being authorized by your foreman, or his representative, and ringing the bell before starting.

Don't walk through escaping steam; go around it.

Don't walk in front of wheels when rolling them unmounted, and when pushing mounted wheels, push at centre of axle and not on rim.

Don't go under a car on jacks unless car is trestled or blocked.

Don't use jacks until you know they are properly set, or start to jack a car up before securing the truck at the other end.

Don't stand near a cable or chain when a heavy pull is being made.

Don't wear gloves or loose clothes when working with machinery or tools.

Don't use tools in bad order.

Don't touch dynamos, generators, switchboards or other electric appliances, or wires connected therewith, before being fully instructed as to their use.

Don't touch the third rail with person or tools. If necessary to remove an object therefrom, use a dry wooden stick.

Don't handle broken power wires without proper protection.

Don't use water, but sand or dry earth to smother electrical flames.

Don't stand with your hands behind your back, with your back towards generator or switchboard.

Don't connect or disconnect bus line jumper cables between electric cars when all cars in the train, or draft, are not either in contact with or entirely disconnected from the third rail or trolley, without first opening the compressor, lighting and heating switches on cars not making contact.—Southern Machinery.

TRADE WITH BRITAIN.

THE following are the official figures of the trade between Canada and Great Britain during September:—

From Canada.	1913.	1912.
Wheat	£6,065,423	£6,322,109
Oats	624,558	558,879
Maize	64,773	17,773
Cattle	36,212	140,315
Bacon	689,207	947,569
Hams	280,778	181,614
Butter	4,522	134
Cheese	2,656,571	2,967,386
Canned Salmon.	600,586	633,990
To Canada—		
Spirits	510,460	515,988
Sugar	36,445	115,831
Iron ore	2,699	9,102
Wool	79,165	93,862
Pig iron	118,652	165,334
Rails	3,784	11,822
Ship, etc., plates	33,869	19,087
Galvanized sheets	400,162	252,697
Pig lead	103,717	184,058
Unwrought tin..	134,038	149,942

RAPID BLAST FURNACE RELINING.

THE No. 3 blast furnace of the Algoma Steel Corporation, Sault Ste. Marie, Canada, was blown out for relining at 2.45 a.m. September 14, 1913. The top of the furnace was removed to be remodeled while the old lining was being taken out. The brick work was started at 9 a.m., September 21, and completed at 4 a.m., October 4. The time drying was 8½ days. The blast was put on at 2.35 p.m., October 15. The total time was 31 days 11 hours 50 minutes. The furnace had been in blast from April 15, 1911. It is 21 ft. 6 in. by 90 ft. and has a capacity of 450 tons a day.

REPORT ON CANADIAN RESOURCES.

IN pursuance of its policy to study trade conditions of the various countries of the world, and to publish for the benefit of manufacturers and exporters of the United States the information thus collected, the Bureau of Foreign and domestic Commerce will soon publish a report by Commercial Agent A. G. Robinson concerning the resources, industries and trade of Canada and Newfoundland.

Smoke Abatement in Pittsburg Metallurgical Plants *

By J. M. Searle **

Due to more active steps being taken by the civic rulers of our large manufacturing municipalities, and to a growing realization of economic benefits derivable by the manufacturers themselves relative to the prevention of smoke, considerable activity has been shown and progress made in different directions in the effort to combat the nuisance, and incidentally to conserve fuel.

I WISH to emphasize in this paper the following points:

First.—That the making of smoke is a direct waste of money to the manufacturer.

Second.—How to attain the best economy and at the same time produce a smokeless stack.

Third.—That the soot which colors the products of our furnaces can be, and is, burned, therefore the phrase "Smoke Consumer" is not a misnomer.

Fourth.—That smoke makers for their own protection, should be compelled to arrange their plants so as to render their stacks practically smokeless.

Fifth.—That much smoke does not indicate much prosperity for our cities.

Sixth. — That the smoke-belching stack should be condemned as a menace to every community in which it exists.

Seventh. — That a column of dense smoke belching from any stack is not only useless, but it is also extravagant and easily preventible.

No Mystery in Smokeless Firing.

To one having both practical and theoretical knowledge of the science of the furnace and the chemistry of combustion, which has come to him through many years of patient and untiring effort in actual service, the conditions under which unnecessary smoke may be abated are not mysterious.

Not a year has passed, however, during the last decade that has not witnessed the formation of societies of theorists for the abatement of smoke. These societies usually employ so-called investigators who, at considerable expense, continue their investigations indefinitely. Usually such investigators begin by attempting to devise some undiscovered method for mysteriously abating smoke, and always, of course, in blissful ignorance of the fact that the best trained and most successful engineering minds of the world have given the subject earnest thought for many years and have hundreds of smokeless furnaces to their credit in the mills and factories of various cities, about all of which there lurks no mystery.

Because of their connection with public societies, these investigators have easily reached the ear of the public and have succeeded in having their ideas exploited, but as such devices as these investigators exploit in the public press are usually found impracticable, the general public have come to believe the practical abatement of smoke well nigh impossible, when the contrary is easily true in every instance.

Installation Feature.

Of course, any one of our best and most popular smoke-abating devices known to-day (and there are many such) will fail of its purpose, if improperly installed, but the manufacturer and the combustion engineers, who have made this work their life study, will never permit such error of design or installation. In fact, the manufacturer of a machine-firing device that will eliminate smoke when properly installed will not sell his machine unless proper plant conditions exist. The day has long since passed when any old boiler and setting is considered a good place in which to install a high grade machine fireman.

There is no longer any mystery in the abatement of smoke. Tell the district manager of any of the good stoker manufacturers the maximum capacity you will force your boilers to deliver, and tell him you require this without a smoking stack, and he will never fail to produce the capacity you require with that smokeless stack or chimney. All that any of the good stoker engineers ask to-day is a free hand and they will produce the desired conditions at your plant. Such conditions may include the re-arrangement to some extent of your combustion chamber and chimney draught, but there is no question as to guaranteed smokeless results by the manufacturer.

Loss From Smoke.

Dense black smoke issuing from a chimney or stack unfailingly indicates waste of fuel. It also as unfailingly indicates the emission of great volumes of invisible carbon monoxide gas, which not only filters into and poisons the atmosphere we all must breathe, but which also robs the plant from which it is emitted of a greater portion of the fuel than (for the same period of time) is being converted into heat-energy for useful work; and this condition, of course, refers to locomotives as well as stationary plants.

When our stacks are smoky we have also an additional loss to the general public, caused by the unnecessary rapid soiling of everything we wear or handle. Who will say that the smoke and grime caused by the imperfect combustion and consequent waste of fuel in the coal-burning furnaces of our large manufacturing centres, do not add at least a dollar a month to the combined laundry and cleaning bills of each individual? and who has the hardihood to suggest that each of us does not pay another dollar a month to the dry goods merchant because of losses sustained in the rapid soiling of fabrics which must not only be exposed to unnecessary soot on shelving and counters, but handled time and again by prospective purchasers?

The Locomotive Stoker.

Probably the most important development in connection with the practical abatement of smoke in the past few years has been that of the successful locomotive mechanical stoker. From a viewpoint of one not familiar with the detail of locomotive construction and operation, it would prbably seem that the development of a locomotive stoker along the lines of well-known stationary practice would be very simple, but when one takes into consideration the limited space available for the application of the stoker to a locomotive, the variation in load, which is from zero to 100 pounds or more fuel burned per square foot of grate area per hour, and the limited space for the construction of the conveyor to convey the coal from the tender to the locomotive proper, and the mechanical abuse that the stoker is subjected to when the machine is run at high speeds, it becomes evident that the field of the locomotive stoker is distinct from that of the stoker which is successful in stationary practice.

The locomotive stoker is now a practical firing machine, after many years of continual experiments in which the railroads have spent large sums of money and a vast amount of patience with unwavering effort.

Requirements in Locomotive Firing.

Each class of locomotive in each class of service requires different treatment, necessitating a large amount of work in the development of the machine for the various services to be met. It is evident

*From a paper presented at a recent meeting of the Pittsburg Foundrymen's Association.

**Chief of Division of Smoke Inspection, Pittsburg, Pa.

that in developing the locomotive stoker, we must meet the following conditions or failure will result:

1.—We must have a machine capable of generating sufficient steam under all conditions of train lading and speed.

2.—A device to burn the fuel in an efficient manner, and in so doing provide a material reduction in the smoke.

3.—The device to be so constructed that it would form a part of the locomotive itself, and not a temporary attachment subjected to the whims of the operator.

4.—That in the application of the stoker no obstruction should be placed in the way of the fireman as far as access to the coal on the tender or to the fire door in the boiler for properly hand-firing the locomotive, either in combination with the stoker or with the stoker entirely inoperative.

5.—That the device should be of such character that its maintenance cost would be low and that it be simple in operation in order to avoid any additional work upon the fireman in operating it.

Improvement During Present Year.

While the outlook toward smokeless locomotives for Pittsburg has very greatly improved during the year 1913, in fact is much better than at any previous date, the same applies to the mills and factories which are always with us. Our office files, and the stacks and chimneys of our city plants and locomotives for 1913 show a marked improvement in smoke abatement over 1912; and judging from what data we now have for prospective equipment for 1914, the total number for the year 1914 will be greater than that of the smokeless installations made during the year 1913; and this changed condition is largely due to the fact that owners and operators have awakened to the fact that it does not pay to operate with smoky stacks.

A Typical Installation.

An instance of labor and fuel saving too important to pass by at this time without mention came to my notice quite recently. An old plant of 55 boilers had become worn out. The insurance company had cut the pressure to 85 pounds; the mill was loaded down with orders. It was concluded, as a last resort, to find a place to locate an up-to-date plant of boilers and double the steam pressure. Eight 600-horsepower units of the water-tube type fitted with good mechanical stokers were installed.

These eight new boilers are saving in pay roll $1,500 per month, and in coal $3,500 per month, which, as you will note, is $60,000 per annum, or six per cent. on one million dollars.

They have, however, done much more than this; they have increased the capacity of the entire mill, which increase is an additional source of revenue, and they occupy but 4,500 square feet of ground, whereas the 55 boilers which were thrown out occupied 45,000 square feet.

Test Data.

It so happened that an evaporative test was being conducted upon one of these 600 horsepower units on the day the writer last visited this plant, and an average capacity of 948 horsepower had been developed for about six hours. The eight individual stacks were absolutely smokeless and the products of combustion had averaged for this six-hour period 12½ per cent. of CO-2 gas; and yet it is frequently heard among men who call themselves steam engineers that we cannot rush a boiler and maintain a smokeless stack.

This plant, which is saving the interest at 6 per cent. on $1,000,000.00, cost complete, $130,000.00, including steel boiler house, main steam piping, feed pumps, Cochran feed-water heaters, ash and coal-handling devices, the latter being for both river and rail. Can better reasons or stronger argument, be produced for the erection of modern boiler plants than is shown by the books of the company from which I have just quoted, and which refer to eight months' operation of their new boiler plant.

In designing a furnace, we must not forget that no one type of device or appliance will suit all conditions. The smoke problem does not take more kindly to a universal "cure-all" than does the human system. On the contrary, each case of smoke abatement must receive individual treatment, or failure will result.

Fuel Conservation.

It has been said by experts of more or less ability that the coal of this country will last for many centuries at our present rate of mining.

A certain manager sent his fireman to jail for stealing a few hods of coal. A few months later a combustion expert showed this same manager how he could save 20 per cent. of his coal at a very small expenditure. He never budged; he was evidently concerned more in the manner of the loss than the cost of it. There are too many such managers. Too many of them prefer to continue paying the cost of the same needed improvements each year rather than invest the money so wasted in improvements that would at once stop such payments and commence to increase dividends at home, and, in many instances, render their plant a joy rather than a continual nuisance to their neighborhood or community.

Accessory Aids.

It must not be understood that the installation of a good mechanical stoker is the last word in boiler room or metallurgical furnace economy, or smokeless combustion, for such is not true.

If we expect to produce high furnace efficiency and smokeless plants we also need some reliable form of CO-2 recorder in our boiler or furnace rooms; also our pyrometer and differential draughtage must constantly point to results. Then, too, in boiler practice the arrangement and relative position of the absorbing surfaces has much to do with plant efficiency. Also the nature of the load carried must be considered when selecting our machine-firing device.

Again, we must not expect too much of the man in front of the boilers, whom we pay from $1.75 to $2.50 per day. We must not expect such a man to understand the chemistry of the furnace. If we do, we will suffer disappointment, for when he has cleared the cobwebs from his brain sufficiently to appreciate the difference between the value of C-0 and CO-2 gas as heat producers, he will have a better job. No, you must place a practically fool-proof "machine fireman" in the hands of the average coal handler, and instruct him to call the engineer when trouble appears, if you expect to conserve your coal pile and produce high furnace efficiency and a smokeless stack. As time passes, your fireman will perhaps call the engineer less frequently, and finally he will understand and care for the machine himself.

The Evaporative Test.

Engineers have spent much thought and money on compounding high-class reciprocating stationary engines and locomotives, and in designing many types of steam turbines, in order to grab the last unit of energy from the steam they have generated, but in far too many instances they have simply closed their eyes to the appalling waste of energy that is constantly sneaking dividends out of our stacks.

It is still considered quite the proper thing by many of our plant engineers to refer all ills in the boiler house to an evaporative test that records the amount of coal used and water evaporated in a given time, but without any reference to gas analysis. When such a test has been completed, the engineer gathers up his memoranda and proceeds to figure out, as he says, the efficiency of his plant, without a scrap of data as to the composition of his products of combustion.

Does he get much information of value from such a test? Not very much. He has commenced at the wrong end of his job. He should have first gone on a hunt for his percentage of CO-2 (carbon dioxide gas) in his furnace products at the breeching. When he had finally determined this, and had brought it up to his liking, would have been time enough to hunt for the efficiency of his boiler or furnace.

Don't commence at the top to run an efficiency test in a boiler house or on a metallurgical furnace. Commence at the coal pile and go up, if you are really looking for results. If more boiler tests were commenced at the coal pile, carried through the furnace and breeching, and finally to the absorbing surfaces, instead of beginning at the absorbing surfaces, more data of value would be on record, and more smokeless stacks would exist, for after all, the last word in smoke prevention with our high volatile coals is and must remain at least 14 to 16 per cent. of CO-2 gas in our products of the furnace, whether such furnace may be for metallurgical, stationary, or locomotive purposes.

"Burning Smoke."

It has been said that the phrase "smoke consumer" is not scientific and that it should not be used, and that smoke, once formed, cannot be consumed. I wish to make it plain here that while I have much respect for the memory of C. Wye Williams and his valued records of research upon the lines of combustion, I cannot agree with him in this particular instance. What is this thing we are prone to call smoke? What makes it black? Is it not carbon passing into the stack at a temperature so low as to form what we call soot? If it is carbon, and I believe we will all agree that it principally is, what must we do to burn it and convert it into the invisible harmless, heat-producing gas called carbon dioxide, CO-2?

The answer is among the easiest of those that are required of the combustion engineer to-day. Supply two volumes of oxygen to each volume of carbon and the ordinary temperature that should obtain in any combustion chamber under any boiler or in any metallurgical furnace, and so arrange your combustion chamber as to force as nearly perfect contact of your oxygen and your carbon particles as may be found practicable, and your soot will never get through that combustion chamber, no matter how dense and black it passes over the bridge wall.

Stack Records.

Some may ask, how are we to know when we have the correct, or approximately correct, volume of air for complete combustion?

First, and accurately, by the use of a good CO-2 Recorder. Second, and approximately, by the intelligent and occasional observation of the top of your stack. Never (when you are not using a CO-2 recorder) let the top of your stack run absolutely clear, if you expect the best average efficiency from your furnace. Carry a haze at your chimney top equal to about 1-10 of No. 1 "Ringlemann," and you will be sure of having a high average percentage of CO-2 in your products of combustion. If, on the other hand, you have no combustion recorder to guide you, and you are running an absolutely clear stack, your surplus air may not only be enough, but it may be many times more than is required for high furnace efficiency, and while a practically smokeless stack always accompanies high furnace efficiency, on the contrary, as you have seen, a smokeless stack does not always indicate such efficiency.

Burning the Gases.

The greatest difficulty in burning bituminous coal smokelessly and with high furnace efficiency lies in the fact that it burns partly as a solid and partly as a gas, and that the gas must be burned in a time much shorter than is required to burn the solids. It may be of interest to note here that 100 analyses recently made have shown that an average of 42 3-10 per cent. of the total heat developed by average Pittsburgh coal is contained in the volatile combustibles, and for the combustion of this hydro-carbon content, a fixed portion of our total air supply is required over the fire.

After some thirteen years, during which I have been constantly in touch with the steam engineers of Pittsburgh, I feel safe in offering the suggestion that these last two conditions are not given the careful consideration that is bestowed upon other details of plant operation. In other words, the adequate supply of oxygen over the fire at the moment when something like 40 per cent. of our gaseous and extremely valuable hydro-carbons are being distilled is rarely, if ever present. In fact, very few plant engineers dig down into the science of the question at all. If they did, the thought would quickly occur to them that we get no smoke from the solids in the fuel (the coke), therefore we must get it, if at all, from the volatile constituents, and if these contain fuel to any appreciable extent, we had better get busy and convert this fuel into useful energy.

When the careful engineer visits a power plant in some one of our good city buildings or mills, and notes the perfect order and organization in the engine room, including expensive compound condensing engines, and then remembers that the boiler stacks issue excessive volumes of smoke, it must indeed, to use a homely phrase, suggest "saving at the spigot and wasting at the bung hole."

Oil Ring Bearing Query.—On my dynamo the oil ring bearing next to pulley throws the oil out at the ends. I would like to know the cause of the trouble and how I can remedy it.—George Munro.

ELEVATOR CONSTRUCTION.

MONTREAL members of the Canadian Society of Civil Engineers were treated on October 16 to an address by Mr. James Spelman vice-president of the John S. Metcalf Co., on the development of the construction of grain elevators, a branch of engineering which is attracting more and more attention in Canada yearly.

Mr. Spelman's address, which was illustrated with lantern slides, covered the history of construction from the day of the old-time millwright, who used only his natural judgment and common-sense in erecting a building of sufficient strength for the purpose required, to the present day, when enormous structures are put up, every feature of which is calculated to a nicety on engineering principles, stress, pressure, spout capacity and evenness of flow, etc., being determined before a steel bar is put up. Screens were shown of elevators in course of construction and completed, among the most modern of which were the Harbor Commissioners' elevators of Montreal.

Discussion.

Following the address, a discussion was entered into by the members, Mr. J. A. Jamieson, an elevator construction engineer, pointing out that the greatest problem in the handling of grain to-day was not so much the style of elevator construction as a matter of expedition and economy. Even with the latest appliances, the handling of grain in elevators, and the loading and unloading from cars and vessels, were subject to delays. Elevators in some cases had been put up more with a view to storage capacity than economic handling of grain per bushel, and he thought the problem of the future would be to secure expeditious and more economic handling.

Mr. F. W. Cowie, chief engineer of the Montreal Harbor Commission thought the construction of elevators would for a long time remain a field for specialists, on account of the special design and intricacies of the machinery required. It was pointed out that the Montreal Harbor Commissioners' elevators had tremendously increased the grain capacity of this port. In the past six years elevators had been constructed in Montreal at a capital cost of four and a half million dollars, handling at the rate of forty-five million bushels a year, and earning a revnue of $250,000, while the grain was handled in them at a rate of 7-10 of a cent a bushel.

Mr. C. N. Monserrat, chairman and chief engineer of the Quebec Bridge Commission, presided at the meeting, which was well attended.

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Vol. X. OCTOBER 30, 1913 No. 18

PRINCIPAL CONTENTS.

SHIPBUILDING AT MONTREAL.

CONSIDERABLE spaee has been devoted in the present week's issue of our journal to an article eovering the reasonableness of having a naval and mereantile marine engineering and shipbuilding plant established at Montreal; to the steps being taken to gradually evolve and develop same; to a consideration of the personnel and eapaeity of its sponsors; to a deseriptive sketch of what has already been aecomplished and indicating in more or less detail, the individual plant units and their contained equipment as embraeed in the general scheme.

The undertaking is sueh as to have required careful consideration and due weighing of the many circumstanees, elimatie, geographieal, and a host of others. In view of this, when we find one of the best known and sueeessful naval and mereantile marine equipment manufaeturers lending not only their support, but world-wide experienee as well to this enterprise at the head of navigation on the St. Lawrenee, it is almost impossible to come to any other conelusion than that shipbuilding will yet take a plaee in the front rank of Canadian industries.

On previous oeeasions, in these columns, referenee has been made to the opportunity that shipbuilding and marine engineering affords in an industrial sense, not only for their own sake, but also because of the aeeessory trades and manufactures whieh follow in their train. We do not believe that sufficient eneouragement has been given those already established plants by our different Governments, and that while a more or less extravagant proposal —in the sense that as a nation we were entirely unprepared and ineapable of giving satisfaetory performanee, to proceed to build a Canadian Navy, was made by the late Government, it must be remembered that eultivation and propagation of the industry of shipbuilding as it presently exists, will do more to put it on a sound basis than is otherwise possible.

In the article referred to, the naval feature oeeupies a prominent plaee, as a matter of faet, too prominent, we think, so far as the elass of vessel is eoncerned. We are not disposed to take the building of "Dreadnoughts" at Montreal, too seriously, and we really wonder if even those behind the shipyard proposition there, have any very real antieipation of doing so. We do not question the possibility of building this type ship, so mueh as believing it to be more of a problem to get these leviathans into deep water, in whieh they ean be handled and manipulated with safety, not only to themselves, but to navigation in the St. Lawrenee generally. That river reeord for merehant vessels of mueh less tonnage, mueh less draft of water, and mueh less construetion cost, does not admit of the absenee of serious doubt as to probable mishap and inconvenienee. So far as the building of the smaller elass of warship is eoneerned there should be absolutely no difficulty, and as regards the produetion of merehant vessels of size equal to the largest oeean liners sailing now to Montreal, there is no obstaele evident that eannot be easily overeome.

The pilot question, if no aetion be taken in the interval, will thrust itself with a good deal of insistenee on the responsible Government, when the navigation of warships to and from the shipyard and drydoek at Montreal develops into a reality, and if past experiences eount for anything, and attempt at "Dreadnought" navigation from eradle to oeean be made, we are pretty well convineed that few, if any of this type vessel will get very far from their birthplaee.

The Canadian Vickers Co., are, however, to be eongratulated on the enterprise shown in taekling what is beyond question a weighty undertaking, and all who have the welfare of our country at heart, in any sense, but more partieularly in its industrial aspeet, will wish them in the eoming years, a measure of sueeess eommensurate with the responsibility undertaken.

MACHINE SHOP METHODS AND DEVICES

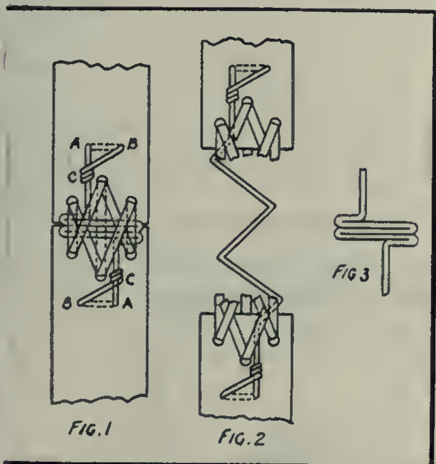
Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

SAFETY KINK FOR BELTS.

By J. C. E.

MANY serious accidents have occurred on account of belts breaking and the ends come flapping down and striking workmen. It is seldom that a belt parts or breaks in two, other than at the lacings, or the holes giving way where the lacing passes through. In the enclosed sketch is shown a kink that will prevent a belt from falling when the lacing breaks or pulls out.

In Fig. 1, is shown a piece of insulated belt-wire. It is bent up in folds, see



SAFETY KINK FOR BELTS.

'ig. 3, and placed on the belt when it is eing laced up—the lacing holding it in osition. The ends are placed through oles at (A), then bent at right angles n the inside of the belt, and passed out gain through the holes at (B). The ods are also twisted a few times around te wire at (C). When the belt lacing reaks, or the holes give out, the belt ods will then draw apart, and the folds i the wire will be drawn out also. This nders the belt slack, and, instead of llling, it will only lay or remain at rest n the shafts. Fig. 2 shows a broken llt pulled apart. A number of these vres should be made up and kept on hnd for emergencies.

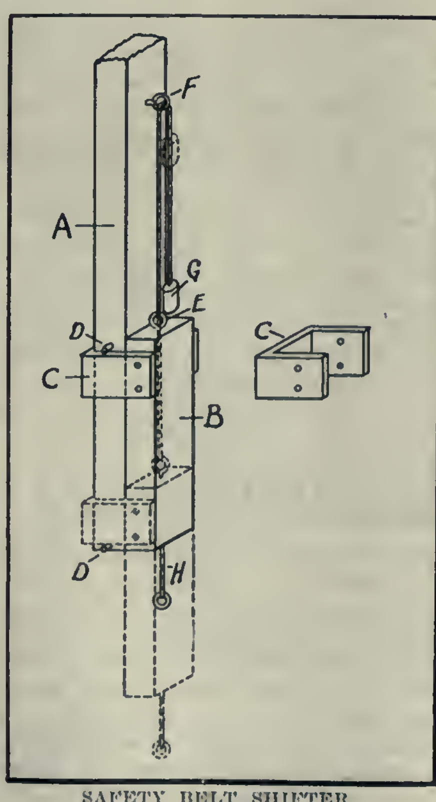
SAFETY BELT SHIFTER.

By James E. Cooley.

IN nearly every factory there are to be seen a number of "belt shifters" extding down so low, that employes wrking near are constantly banging teir heads up against them. Many wrkmen have been nearly knocked out, c have received deep cuts from these belt-shifters. If a "shifter" is up too high, a short person cannot reach it, besides it is necessary that it be as low down as possible, so that it can be grasped firmly, and the arm movement be directly forward from the shoulder.

In the accompanying sketch is shown a "belt shifter" that can be left as high as necessary, and yet the shortest person can reach it. A guide (C) is made from a piece of sheet iron and fastened to a wood extension (B), which is then placed on the shifter (A). Two pins are driven in the side of the shifter at (D), and act as a stop when the extension is moved down and up. Two screw-eyes (E) and (F) are placed as shown. Attached to (E) is a light chain, that slides through (F), having a small counterweight (G) fastened on the end. A similar chain, any convenient length, is placed at (H).

The method of operating is simply to pull down on the chain (H), grasp the extension (B), and move the "shifter" as required, then by letting go, the weight (G) pulls it up out of the way. There is no danger then, that it can ever be left down. The chain (H) should be long enough so that the shortest person can reach it. It can never do any harm when run into.



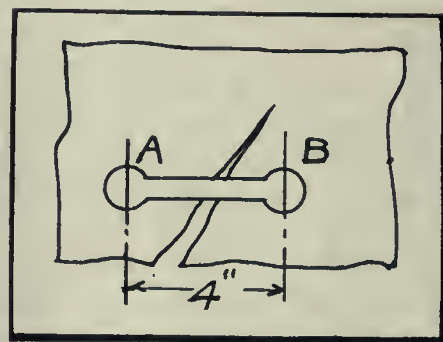
SAFETY BELT SHIFTER.

REPAIRING CRACKED FACE WITHOUT PATCH.

By William Stewart.

TO repair any working face which is cracked and where it is undesirable or impossible to fit a patch with screws or rivets:—

Drill with flat drill the holes (A) and (B), 1½ inch diameter by ⅜ inch deep by 4 inches apart. Next, cut with a cross cut, the space between, ¾ inch wide and ⅜ inch deep. Mark out a piece of ⅜ inch bar iron to the same sizes with the exception of length, which should be ⅛ inch shorter. Make it red hot; it will then fit exactly, and by action of cooling



CRACKED WORKING FACE REPAIR.

will draw the cracked piece of machinery tightly together. File off any burs showing after which the job is repaired solidly and neatly, with exactly its original fit.

ENGINE TESTS FOR MISALIGNMENT.

By James E. McCormack.

HEREWITH are some engine tests which I have found useful. The fact that a number of men have (after assisting me to make these tests on the engines which they themselves were in charge of) voluntarily assured me that they had never before seen similar tests applied emboldens me to offer them this:

If a clean, properly-designed and properly lubricated crank pin bearing persistently heats when keyed just tight enough to eliminate the knock, the trouble may be due to the crank shaft or the crank pin being out of line, or to the bore of the crank pin brasses not being at right angles to the centre line of the connecting rod.

Test Procedure.

To test for these defects, on an engine that has run long enough to have its brasses bedded to fit the crank pin properly throughout its whole length, uncouple the connecting rod at the cross-head end and adjust the crank pin brasses so that they lightly bind on the pin. This can be ascertained by moving the disconnected end of the rod back and forth. Next, put the brasses and keys in the cross-head end of the rod, but keep it disconnected from the cross-head. Now move the cross-head so that the brasses in the rod stand directly over the cross-head journal and note if they do stand directly over or a little to one side.

The crank should now be moved one-quarter revolution, and the detached connecting rod end again lowered onto its journal, the operation being repeated at each quarter revolution, preferably at the dead centres and mid-strokes. If in each case the rod end falls into its place without requiring to be sprung or forced sideways, it is proof that the main shaft, crank-pin and crank-pin brasses are all true. If the rod stands to one and the same side equally at all four points of the revolution, it is proof that while the shaft and crank-pin are true, the bore of the brasses is not at right angles to the centre line of the connecting-rod. If the rod end varies, passing during a revolution sideways over both sides of the cross-head journal, it shows the crank-pin to be out of line. If it varies, but always remains on the same side of the journal, it is the main shaft that is out of line.

Under the above conditions, to hold the rod end to its place at all times would require a strain sufficient to spring the rod by force, and this strain would be transmitted to the crank and cross-head pins through their boxes, and as the direction of the strain reverses with each stroke, it produces a knock.

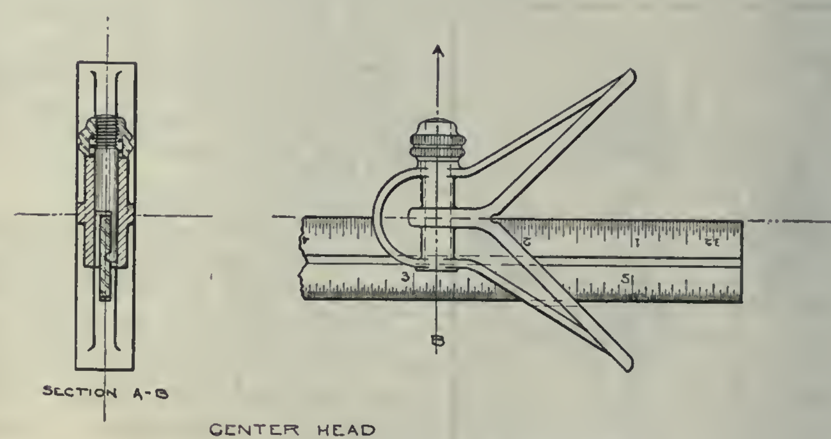
If the crank shaft is level, but is not at right angles to the line of the engine, or if the outer end of the crank-pin is inclined upward when the engine is at mid-stroke, either top or bottom, then this strain will be greatest when the engine is at the dead centres, but if the outboard end of the crank shaft is high or low, or if the outer end of the crank-pin is inclined upward, most when the engine is on one dead centre, then this greatest variation and the greatest strain will be at mid-stroke, and it is not at these points that the resulting knock will occur.

The cross-head pin and the bore of the cross-head end brasses may be examined in the same manner, except that it is not necessary to test these at four different points. If either are out of line, you can make certain which is at fault simply by (where possible) connecting the rod to the pin upside down, and then if the fault is in the brasses, they, being now upside down, will incline the rod to the opposite side from where it stood when connected right side up. This test is very seldom necessary owing to the small amount of wear at this point.

Adjustment Pointers.

I will now conclude by mentioning a couple of items which, although most generally known, may be of assistance to some of the beginners who are readers also.

When adjusting the connecting rod brasses it is well to have the engine on centre for adjusting the crank-pin brasses, and at mid-stroke for adjusting the cross-head journal brasses, for by this method the brasses are keyed to fit the least worn or "high" sides of the pins.



STARRETT COMBINATION SET FEATURES.

Sometimes when an engine develops a knock, which occurs only once in each revolution, the knock may be caused by the clearance between the piston and the cylinder head not being equal at each end of the stroke, or it may be the result of too early admission or too late a release at one end, either of which can be detected by means of an indicator, and the rods adjusted accordingly. Of course, it is well to be sure that the knock is not due to improper adjustment of the guides or unequal clearance before changing the valves.

DEVELOPMENT OF THE MECHANIC'S COMBINATION SET.

THAT much overworked word, "efficiency," the slogan of the mechanical and engineering world to-day, has been and is behind the studies of every motion which men make in their day's work. Not only is much attention paid to the operations of the workmen, with a view towards eliminating those motions which are not essentially result producers, but the equipment they use is as carefully studied to insure every convenience for quicker and easier work. Only those tools or parts of tools are retained which actually aid in the production of the desired result. The study of this problem of greater results with less effort is a relatively modern one. Yet, nearly forty years ago a man, now famous in the mechanical world, concentrated his efforts on one phase of this problem and produced a tool which has since worked wonders in advancing the capacity of mechanics to turn out better work.

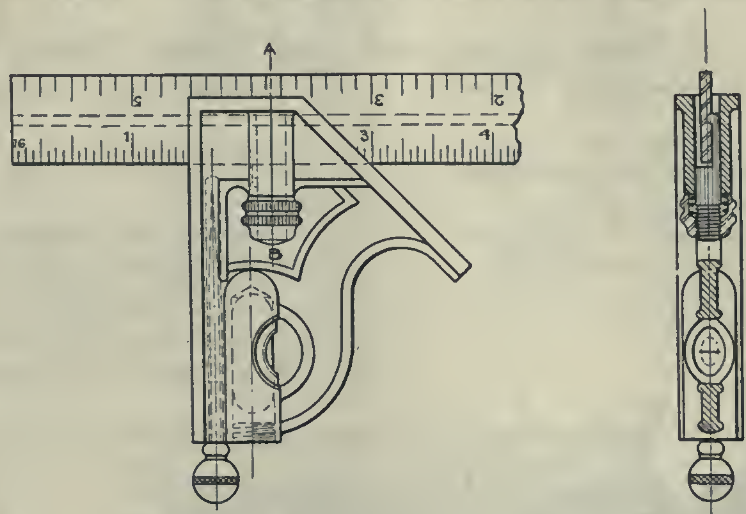
When L. S. Starrett started work, he developed a tool to take the place of the steel rule and try-square with graduated blade, which he felt were unnecessary duplications. As he studied, he also saw how these two tools might be combined with others. He, therefore, experimented with many forms of combinations until he finally selected the method now used. This method consisted, first, of milling a half-round groove along the centre of one side of a steel rule. In the head of a try-square there was also milled a slot wide enough to slide the rule through. With the lower edge of the rule on the bottom of this slot, a lock bolt is fitted in such a manner as to guide the sliding of the rule. The lock bolt could be raised or lowered by turning a thumb screw, and the rule could slide into the head of the square, and be locked at any desired position by setting up on the thumb screw, thereby clamping the lock bolt against the groove in the rule and preventing further sliding. The results obtained by the combination of the rule and square were so satisfactory that Mr. Starrett added still other tools to the combination.

By adding to the head of the square another surface at an angle of 45 degrees to the rule, the tool became a 45 degrees mitre. Next, into the web containing the square and mitre surfaces, a small level was set. Then, finally, a hole was bored in the bottom of the square and fitted with a brass bushing whic held a small scriber, thus what corresponds to the fixed head of an ordinary square became a square, level and mitre. In addition, a handy scriber was provided, and the sliding feature permitted use as a depth gauge or marking gauge.

Considering further possible extensions for the scope of this new tool, it was realized that one of the commonest processes is that of centering round pieces, consequently, a centre head was added to the combination square, making it slide on and fasten with a thumb screw, just as the head of the square does. In this form the first attempt to market the tool was made. Mr. Starrett made personal trips to various large machine shops educating workmen to the advantages of the combination and soliciting orders. So rapidly did the new tool impress itself in favor with workmen that for a while to manufacture it in sufficient quantities was the greatest problem. When the manufacturing end was finally running smoothly and the general supervision left to subordinates, Mr. Starrett began applying himself to improve the tool.

Provided now with removable heads, it was logical that any other improvement should be in the nature of an additional head for any new purpose. A protractor head provided with a long bearing edge and clamping attachment was added. In this was fixed a spirit level, so arranged that with it, to indicate the horizontal, the protractor could be made to show the angular deviation therefrom. In addition, the protractor and rule make a most convenient tool for laying out angles.

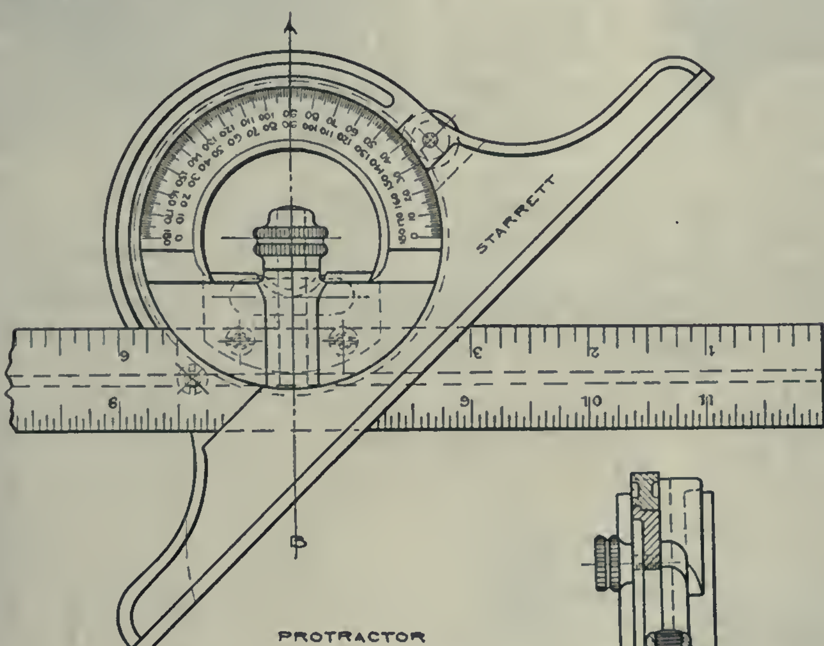
The complete combination set as now manufactured consists of four parts, the groover rule and the three heads—square and mitre head, centre head, and protractor head. The rule is graduated along all four edges in desirable units, such as 8ths, 16ths, 32nds and 64ths, or 100ths of an inch, or in metric units. Any of the heads will easily slide off or on instantly, and may be used independently or in conjunction with either of the others. The tool takes up far less room than would separate tools of equal scope, and is much more convenient. With this combination set, a mechanic is enabled to do more work and do it easier.



SECTION A-B

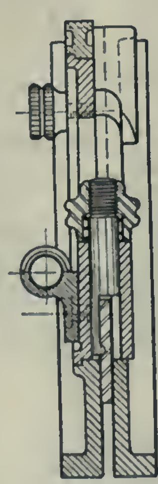
COMBINATION SQUARE

STARRETT COMBINATION SET FEATURES.



PROTRACTOR

STARRETT COMBINATION SET FEATURES.



SECTION A-B.

In connection with the story of the development of the combination set, it is an interesting fact that commercially the Starrett tools met with such success that the business grew from practically nothing up to its present prominence and distinction as a corporate body doing business under the name of the L. S. Starrett Co., and known throughout manufacturing circles as "The World's Great Toolmakers."

LABOR STATISTICS.

According to the record maintained in the Department of Labor, there was continued improvement in September. There was a still further decrease in the number of strikes and lockouts in existence, and a favorable record is shown when a comparison is made with the same month of last year. There were altogether eleven trade disputes in existence throughout the country, as compared with eighteen last month, and twenty-one during September, 1912. Only two of these occurred during September.

Of those in existence before that time, the only one of importance as affecting industrial conditions to any great extent was that of the coal miners on Vancouver Island, which remained unsettled at the end of the month, although there were not so many men out of work as a result of it as before. Upwards of 78,000 working days were lost through strikes during September, as compared with a loss of 109,530 during the preceding month.

DEVELOPMENTS IN MACHINERY

A Record of New and Improved Machinery Tending Towards Higher Quality and Economical Production in the Machine Shop, Blacksmith Shop or Planing Mill.

NEW LANDIS SIX CHASER STATIONARY PIPE DIE HEAD.

THERE is here illustrated a new pipe die head, recently placed on the market by the Landis Machine Co., of Waynesboro, Pa. The head is extremely simple in construction, and is

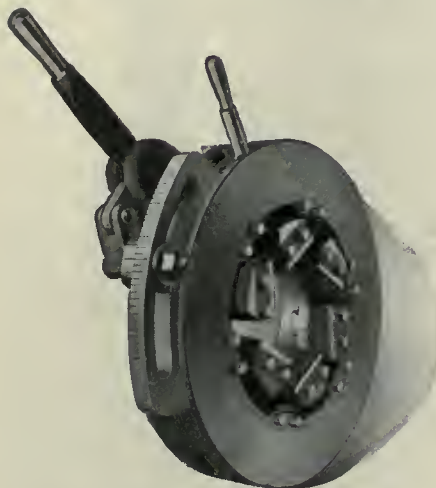


FIG. 1. LANDIS NEW PIPE DIE HEAD.

applicable to certain pipe machines of the rotating pipe type. A general idea of its operation may be obtained from Fig. 1. As will be noted, the head is composed of four major parts—namely, the head body, which carries the chaser slides; the chaser slides; the operating ring which imparts the oscillatory motion of the handle to the chaser slide, giving the chasers a universal radial movement to and from the centre; and the chasers.

There are several important characteristics of this die that are worthy of note. Its life, it is claimed, is many times greater than that of the ordinary hobbed type die. Moreover, the line contact which the chasers have with the work reduces the friction to a minimum, and permits of much higher cutting speeds. This increase in speed is augmented by the flexible rake feature, whch makes it possible to obtain the best cutting condition and to successfully thread all grades of pipe, whether iron, steel, brass or copper.

Since the lengths of thread on the standard sizes of pipe are fixed, a die that requires grinding in the throat is of little or no value, as a few grindings will cause the length of thread to fall below the standard. This objection is eliminated with the Landis die, since the cutting contour is always the same, due to the fact that the chasers are ground on their inner ends, and never on the bevel surfaces which form the throat.

At a recent test made in the plant of one of the largest Eastern pipe mills, a circumferential cutting speed of 40 feet per minute was maintained. This means that the various sizes of pipe were rotated in accordance with the accompanying table:

Size of Pipe.	Revs. per min.	Ft. per min.
3/8 in.	227	40
1/2 in.	181	40
3/4 in.	144	40
1 in.	116	40
1 1/4 in.	98	40
1 1/2 in.	79	40
2 in.	64	40

As one set of dies covers the entire range on all sizes of standard pipe where the pitch is the same, it is unnecessary to remove the chasers from their holders, except for grinding purposes. Their removal is accomplished by slackening the two chaser clamping screws on each chaser holder just enough to allow the chasers to be slipped from their seats. They are set to the proper position by bringing the cutting edges flush with the flat surfaces on the chaser slide, provided for that purpose. A steel scale or straight edge will simplify this operation. Mention should be made of the mill chaser clamps which overhang the chasers and protect them against split and twisted pipe.

The makers call attention to the economy of this die as far as equipment and upkeep are concerned. The chasers, which can be used on all sizes of standard pipe where the pitch is the same, are hard throughout their entire length, and never require annealing, hobbing or re-tempering. They are also interchangeable; that is, any one or more of a set can be replaced without renewing the entire die. Every feature tending toward economy and increased output has been incorporated in this head.

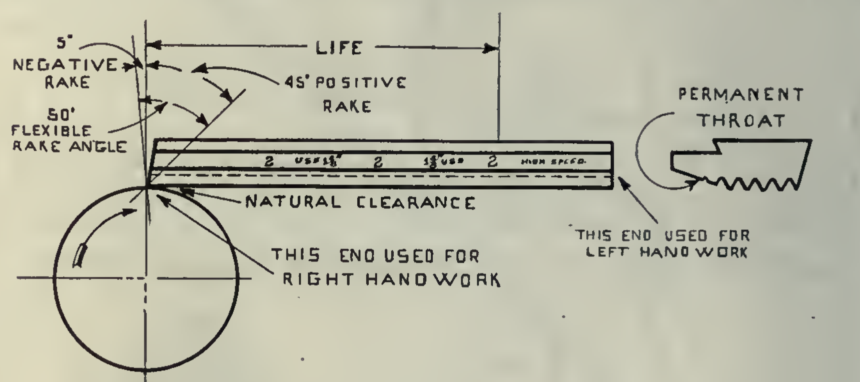
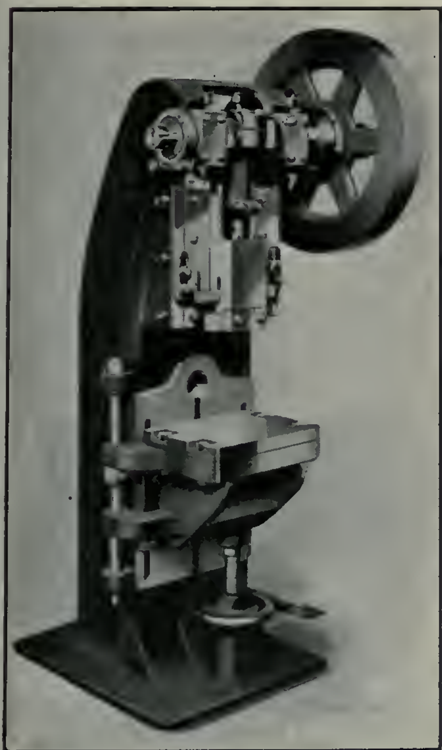


FIG. 2. DESIGN FEATURES, LANDIS NEW PIPE DIE HEAD.

HORNING AND WIRING PRESS.

A NEW horning and wiring press developed by The Cleveland Machine & Mfg. Co., Cleveland, Ohio, has been put on the market. In its construction is embodied the special "Cleveland" features recently described on their inclinable presses, viz.: bronze bushings for shaft bearings in frame and fly wheel, safety latch on clutch pin, increased diameter of crank pin, hinged brake band with compensating spring for wear and expansion, and quick adjusting knock-out device.

This machine is used largely for the operation of wiring dies, for wiring the



NEW HORNING AND WIRING PRESS.

edges of pails, cups, reflectors, etc. The frame is bored for a horn. These horns may be either plain for holding, piercing or riveting dies, or of duplex construction for folding and locking side seams on pails, tubs, furnace pipe, and other articles made out of tin or light sheet steel. The screw adjustment under the knee permits setting it to any desired height for wiring dies of different depth. When using the press with a horn, the screw is lowered and the knee is swung around out of the way of the operator.

This machine, known as No. 24, is one of four sizes of the same general design. It weighs 1,850 pounds, and occupies a floor space of 28 in. by 30 in.

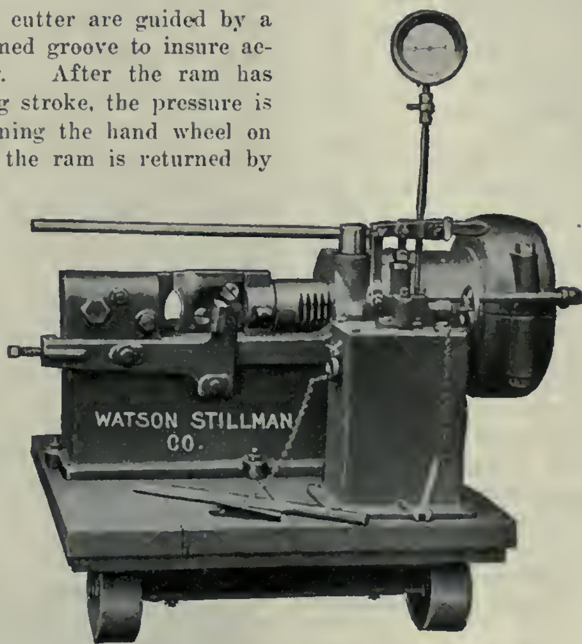
HORIZONTAL HYDRAULIC SHEAR.

THIS horizontal shear of 175 tons capacity for cutting 4½ inch steel cables and large sizes of rolled steel has just been put on the market by the Watson-Stillman Co., 50 Church Street, New York. It is evident that a horizontal shear of this type has several advantages over those of vertical type, permitting as it does more convenient handling of material to and from the tool. In shops where traveling cranes are used to carry the stock, the advantage is still greater.

Because of its weight, the tool is mounted on flat wheels to render it more convenient for use wherever needed in shipyards, factories or machine shops. The pump is entirely independent of the cylinder, making the valves and pump parts easily accessible. In shops equipped with an hydraulic system, the hand pump may be eliminated and direct connection made to the high pressure pipe line.

The ram and cutter are guided by a carefully machined groove to insure accurate shearing. After the ram has made its cutting stroke, the pressure is released by turning the hand wheel on the pump, and the ram is returned by the rack, pinion and lever arrangement. The pinion lever is shown pointing toward the left. The teeth of the rack and pinion are protected from excessive stresses due to the jump of the ram at the instant of rupture by mounting the pinion upon a spring. The gauge, directly connected with the pipe line, indicates the exact pressure at all times.

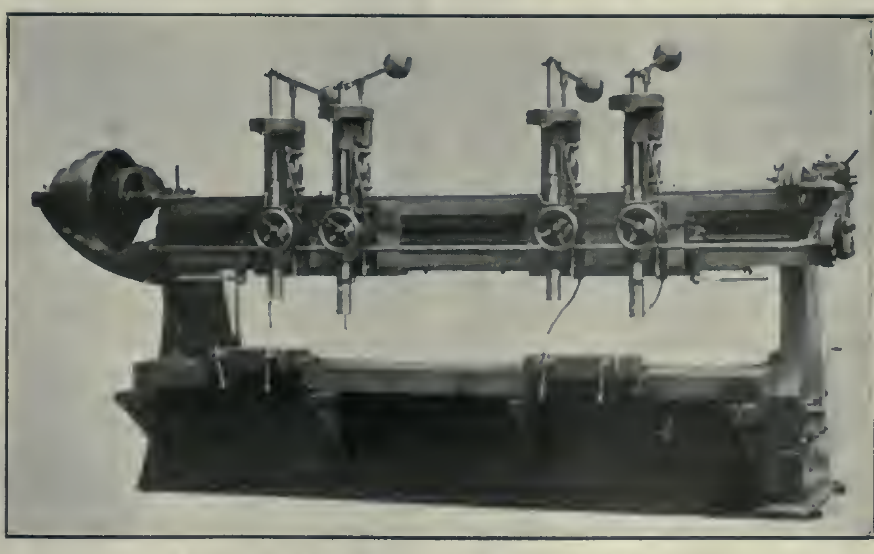
This tool represents many years of experience in the manufacture of hydraulic shears, and cost, strength, durability, simplicity and efficiency seem to have been as carefully combined as possible, making an ideal tool for shops where much large stock must be cut.



HORIZONTAL HYDRAULIC SHEAR.

MUD RING AND FLUE SHEET DRILL.

THE four spindle machine shown herewith has been brought out by the Foote-Burt Co., of Cleveland, Ohio, and is intended for use in railroad locomotive boiler shops and general boiler shops for drilling the rivet holes around a mud ring, and for cutting out the flue holes in a flue sheet. The spindles are of the independent feed type, each one being arranged with automatic knock-off to power feed, and the quick return of same is taken care of by the use of a hand wheel located on the front of the head. Each spindle is also arranged with clutch for stopping and starting, and interlocking mechanism so that the feed cannot be thrown in with the



FOOTE-BURT NO. 2 MUD RING AND FLUE SHEET DRILL.

spindle stopped or vice versa. With this independent feed feature, some of the spindles are always drilling while the operator is setting the other spindles, so that the full efficiency of both the machine and the operator is obtainable.

The spindles of this machine are arranged in pairs, mounted on auxiliary cross rails, and are adjustable on these cross rails to a minimum centre distance of 8 inches. The advantage of this feature is that it is possible to set the spindles to the proper spacing of the rivet or flue holes, and then adjust two spindles along the main rail of the machine, maintaining the proper spacing and eliminating the necessity of spacing each one individually. The spindles overhang the front edge of the base 8 inches, to take care of the mud ring work, and the table is provided with chucks for holding the mud rings. The table has an in-and-out motion of 36 inches, and is supported out under the spindles by the bracket slides on the front of the base.

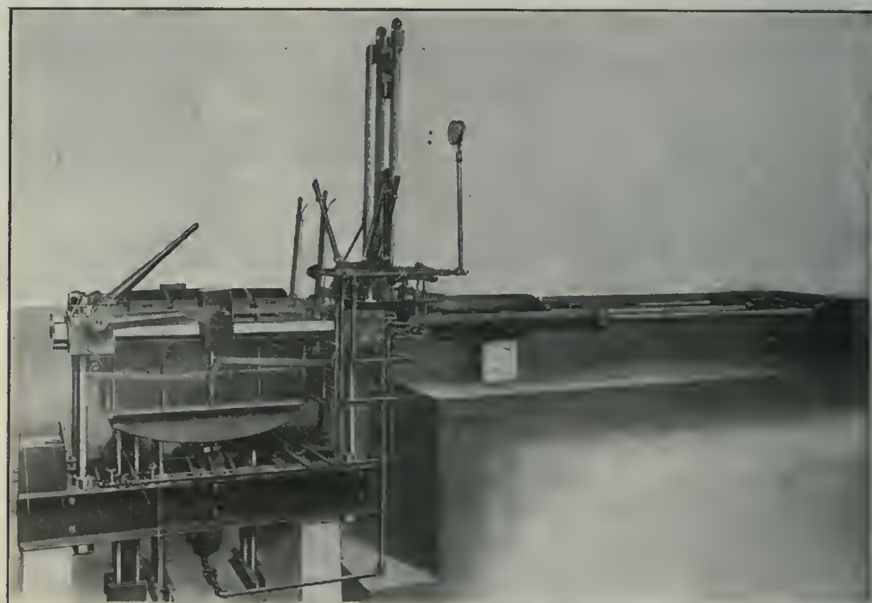
Three changes of power feed are provided, any one of which is instantly available by simply shifting a lever at the right hand end of the machine. Six changes of speed are provided by three step cone and throw-out back gears. The machine weighs approximately 21,000 lbs.

200 TON HORIZONTAL SHEET METAL SCRAP HYDRAULIC BALING PRESS.

THE illustration shows a new type of sheet metal scrap baling press, recently designed and built by the Hydraulic Press Mfg. Co., Mount Gilead, Ohio. This press is operated by hydraulic pressure and fills a long-felt need in the iron and steel field. It will bale sheet metal scrap up to No. 10 gauge, and is of the horizontal type. It is installed so that the top of the box is flush with the floor line, making it convenient for forking the scrap from the floor into the press without elevating it. The box is 20 in. wide, 30 in. deep, and 60 in. long. The normal size of the pressed bale is 10 x 12 x 20 in., and weight 250 lbs. The cast steel door forming the top of the box is counterweighted, and can be moved easily with the hand lever. This door unlocks and opens automatically as the horizontal ram returns to its starting position after the bale has been formed.

The press is equipped with two hydraulic cylinders for pressure purposes, one for compressing the material into the top of the box, and the other for compressing the material into the end of the box. To the horizontal cylinder is attached two auxiliary cylinders for returning the horizontal ram. The pressure platen forming the bottom of the box is locked into position by two lock bolts passing into each end of the platen, and which are operated by hydraulic pressure after the platen completes its upward movement. This saves the platen from tilting strains, while the horizontal pressure platen travels across it during its movement in pressing the material into the end of the box. These lock bolts are also removed at the proper time by hydraulic pressure.

In the head end of the lower platen, which forms the bottom of the box, is fitted a small ejecting platen, to which is attached a 4 inch ram working in an ejecting cylinder located on the sills in the head end of the press. As the lower platen travels upward, it carries with it the ejecting platen and ram which permits the 4 inch cylinder to fill from the pump reservoir by gravity. As soon as the scrap metal has been pressed into a bale, the door forming the top of the box opens automatically, as already described, and the pressure is applied to the ejecting cylinder which causes its ram and platen to rise, thus forcing the bale out of the box level with the floor line, where it can be easily removed.



200 TON HORIZONTAL BALING PRESS FOR SHEET METAL SCRAP.

The valve equipment required for performing all of the operations here described is controlled by an interlocking device, which compels the operator to throw each valve lever in its proper turn, it being impossible to operate in any other manner. A tell-tale board with graduations and indicator weights governed by cables attached to moving parts of the press indicates to the operator the position at all times of the vertical and horizontal pressure platen. The press is built strong and rigid throughout, steel being used in all parts receiving the strains.

CONTROL APPARATUS FOR ELECTRIC MAINS.

IT has often been desired to control apparatus connected to public electric mains by some means which could be put into operation at the central station without the provision of special leads for the purpose. Many suggestions have been made, such as the reversing of the mains, or by earthing one pole at the station when it was desired to operate the distant mechanism. So far, however, no very practical result has been effected, as such means as those just mentioned have obvious disadvantages. Control from a distance is particularly desirable in the case of street lighting. At present clockwork switches are used to some extent so as to get over the difficulty, and where these are not used—and even where they are in use to some extent—a lamplighter is required to make his rounds in order to illuminate and to extinguish the lamps at the desired hours.

Apart from the question of the cost of labor involved, this method leads to the switching on many of the lamps considerably in advance of the time when they are really required, and, similarly, the extinction of a large proportion of the lamps is delayed beyond the hour when lamps are necessary owing to the fact that a considerable time is taken in making the rounds. So far, gas has been in a happier position, for it is possible to turn street lamps on or off by a variation in the pressure, and thus in competing against electricity for street lighting, gas has been at an advantage.

TRADE AND COMMERCE RECORD

Dealing With the Steps Being Taken and Progress Made by Industrial Canada To Achieve and Maintain a Dominant Place in the Markets of the World

GRAIN EXPORT.

THE export of grain from the port of Montreal for the present season will be from sixty to sixty-five million bushels, according to an estimate which has been made at the offices of the Harbor Commissioners. This output will be double, or more than double, the quantity exported last season, which measured up to rather more than thirty million bushels.

Grain received in the harbor elevators to date is estimated at fifty-one million bushels from the commencement of the season. At the present moment there are only two and a quarter million bushels in the Harbor Commissioners' elevators, and not more than about a quarter of a million bushels in the Grand Trunk elevator, so that there is space for the accommodation of another million and a half bushels.

That the spare space will be needed before the end of the season, and will, indeed, probably be overtaxed, is evident from official reports which have been received from inland ports. There were 20,000,000 bushels in the elevators at Fort William on October 9, and the quantity is now almost certainly greater, while the elevators at Tiffin, Goderich, Depot Harbor, Midland, Owen Sound, Point Edward, Port Colborne and Port McNicoll are packed.

Grain is being sent down to Montreal as speedily as possible, but just at present there is a shortage of cars available on the Grand Trunk, so that water transit is the only means available, practically, for sending the grain, but further facilities will be provided just as soon as the difficulty caused by the temporary car shortage can be overcome.

ST. JOHN. N.B., AND THE C. P. R.

CONSTERNATION was caused in St. John recently when it was learned that the C.P.R. had made Halifax the only point of call during the coming winter. Sir Thomas Shaughnessy, interviewed about the change in the company's policy, said:

"St. John is the Canadian Pacific Co.'s winter port, and traffic handled to and from Halifax is by grace of the Intercolonial Railway Co. The Atlantic mail service during the past few years has been most unsatisfactory. The call at both Halifax and St. John involved undue risk to the vessels in making the trip between the two ports along the coast of Nova Scotia in all sorts of weather, and eastbound passengers who embarked at St. John were necessarily subjected to a delay at Halifax of from twelve to twenty hours. The company would have sacrificed its interests in the mail subsidy rather than make the two calls again. With St. John the Atlantic terminus of the company's lines, it would have been natural to adopt that port, but the outlook for steamship traffic during the coming winter made it evident that the facilities at West St. John would be overtaxed if an attempt were made to handle the two Empresses there as well as the large fleet of other steamers that will make St. John their port this winter. The arrangement is only a tenative one and will be subject to revision when St. John has the harbor and wharf facilities properly to accommodate the ocean traffic naturally tributary to the port. The company decided upon its policy after the subject had received grave consideration and the Government was no factor in its determination."

A settlement of the difficulty in connection with the St. John, N.B. protest against the withdrawal of the C. P. R. Empress liners and the Allan liners, Calgarian and Alsatian, from that port, has, it is said, been reached between the steamship authorities and the delegation which waited upon Mr. Borden at Ottawa.

The result was, it is understood, that the C. P. R., although they will take away the Empress liners, will next winter replace them with two new steamers, the building of which is well under way. They will be of the one-class type, with a cargo capacity of 6,000 tons. They will be able to carry 520 second-class, and 1,200 third-class passengers.

St. John will have as many mail steamers calling as before, for according to a high official of a trans-Atlantic steamship line, arrangements have been made whereby the Canadian Northern "Royal" steamers will make St. John their port of call, which, with the two Allan mail steamers calling there each month, will give them a weekly mail service as before.

SHIPPING MEN WAIT ON GOVERNMENT.

A DEPUTATION of the officers and members of the Dominion Marine Association, representing practically all the Canadian marine interests on the Great Lakes, waited on Hon. Geo. E. Foster, Minister of Trade and Commerce, and Hon. J. D. Hazen, Minister of Marine on October 17, and discussed with them important matters relating to the autumn grain movement, water carriage rates on the lakes, American competition, grain storage facilities, life-saving appliances on vessels, and other matters.

The deputation strongly urged that the recent increase in the tonnage of the Canadian-owned vessels on the lakes were sufficient to handle the Western grain crop movement at reasonable rates, and that there should be this autumn no repetition of the action taken by the Government last year in suspending the coastal trade regulations so as to permit American vessels to enter into the Canadian coastal trade and carry off more than their fair share of the grain cargoes.

Hon. Mr. Foster, while not giving the deputation any positive assurance, intimated that the Government, in view of the improved conditions, did not anticipate that it would be necessary to rescind the coastal regulations again this year.

The delegation representing the Dominion Marine Association comprised the following:—Messrs. L. Henderson, Montreal; A. E. Mathews, Toronto; H. W. Richardson, Kingston; George E. Fair, Collingwood; A. A. Wright, Toronto; E. E. Horsey, Kingston; S. V. McLeod, Sault Ste. Marie; D. Murphy, Ottawa; J. W. Norcross, Toronto; James Playfair, Midland; Frank Plummer, Toronto; F. S. Wiley, Port Arthur, and Captain Bassett, Toronto.

C.P.R. AND AUSTRIAN GOVERNMENT.

IN connection with the Austrian situation, the following official statement has been issued by the Canadian Pacific Railway Co. in Montreal:—

Seeing that considerable misconception appears to exist as to the nature of the activities of the Canadian Pacific Railway on the Continent of Europe, it should be explained that in conducting its passenger business, strict instructions have been issued to all Canadian Pacific agents on the Continent of Europe to follow strictly the letter of the law in their respective countries, as it has always been the desire and policy of the Canadian Pacific Railway to conform without question to the wishes of the Governments of the countries in which these agents are permitted to do business.

In the case of Austria, the Canadian Pacific Railway, knowing the natural dislike of the Austrian Government to the heavy emigration over its frontiers. went out of its way to show the Austrians how they could control that emigration—namely, by concentrating the stream on the Austrian port of Trieste, where careful examination could be made of the emigrant's antecedents and papers. It was also recommended that Austrian Government inspectors should travel on all steamers from Trieste to ensure the proper treatment of Austrian subjects on the voyage, and to prevent the possibility of exploitation by undesirables.

Such examination and protection could not be effectively made under previous conditions, where emigrants could leave by so many different frontier stations, thereby making effective control impossible. The Canadian Pacific Railway obtained its concession for emigration business in Austria purely as a carrying Company, and has strictly forbidden its agents to conduct or promote any propaganda whatever in favor of emigration, the tickets issued being almost entirely prepaid by friends and relatives who have settled in Canada or the United States, and who would, therefore, have left their native country in any case.

Passenger offices were established in Austria with the consent of the Austrian Government, and the Canadian Pacific agents were in each case approved of, and in some cases were even nominated both by the central authority in Vienna and by the local authorities in the respective provinces, the object being to prevent any possible abuse by irresponsible agents.

The line of steamers established by the Canadian Pacific Railway from Canada to Trieste was put on at the direct request of the Austrian Government in order that the merchandise business between Austria and Canada might be shipped direct from an Austrian port.

The carriage of Austrian subjects by all Canadian Pacific steamship lines this year have amounted to only 11,961, as against 14,000 in 1912. This is but a small percentage as compared to the carryings of the Continental Pool lines, which numbered 109,123 in 1911 and 201,294 in 1912.

THE MARINE MOTOR IN CANADA.

NOTWITHSTANDING the financial stringency which is affecting Canada to a marked degree, this is a wonderful year so far as motor-boating is concerned, says the "Motor Ship and Motor Boat." Naturally, when money is tight, people economize on their pleasures, and no doubt the industry has been affected in common with other branches of commerce, but there are now more boats in use than at any other period. From the Atlantic to the Pacific, the reports are practically all to this effect.

Canada a Good Market.

Canada is a splendid market for all types of boats and engines. For the thousands of boats on the Inland Lakes, the demand is chiefly for small horsepower engines, while, on the St. Lawrence, the types are from the tiny pleasure boat up to the passenger and trade craft requiring Diesel engines. On the Atlantic, the fishermen are the best customers, and on the Pacific coast we find many boats, chiefly of the cruiser type, fitted with heavy-duty engines. They are very strongly constructed, for the coast is rugged. Motor-boat racing is becoming more popular every year, and this season has been notable for the increase of hydroplanes.

The Engine Market.

In this expanding motor-engine business, British firms have, unfortunately, very little share. It is true that several are represented on this side, but their productions are not pushed. Apparently, British firms are content to allow the Americans to secure the bulk of the trade without even an effort to divert it. Most of the better-known United States makers have agents in the principal cities and towns—and they may be given the credit for advertising and pushing their goods. They freely use trade papers, and also—which is important—have stocks on hand. Many dealers admit that if buyers desire a first-class engine, and will pay the price, nothing can beat British goods, but there is little on the market to compete with the comparatively cheap Canadian and American engines, which too often have to be scrapped after a short period of working.

In connection with British engines, it may be mentioned that the Thornycroft-engined cruiser owned by Mr. Cockburn, of Montreal, is to be used for a trip up the Labrador coast to Hudson's Bay. She will be the first internal-combustion-engine-driven craft to visit this wild district.

Sir Charles Ross, of Quebec, is having a cruiser built in Scotland in which two Thornycroft engines of the paraffin type will be installed. Sir Charles already owns a cruiser fitted with a Thornycroft engine.

A 100 h.p. Thornycroft engine has been purchased by Mr. Mark Workman, of Montreal. This is installed in a cruiser-type runabout hull of solid mahogany, 36 ft. long by 6 ft. beam, and is in use on the Rideau Lakes, Ottawa. The boat has a speed of just over 26 miles an hour.

The Canadian Government has given a contract to V. M. Dafoe, of Vancouver, to construct a motor lifeboat for use at Vancouver Island. The cost is $10.000. She will be the first of the kind to be constructed in Canada, the policy of the Administration now being to have all vessels for Government service built in Canada. The vessel will be the third of the type actually in service. They are 36 ft. ocean-going vessels, unsinkable and self-righting.

"Ankle Deep," representing the Lake George Racing Association, is the winner of the gold challenge cup of the American Power Boat Association, which means that the cup leaves the shores of the St. Lawrence after being there for nine years. Many Canadians were present at the race at Alexandria Bay. "Ankle Deep came in ahead on two following days, and on the second day did the 30 miles in 47 mins. 29 secs. The cup was defended by "Mitt II.," on behalf of the Thousand Island Yacht Club, the holders. On the second day, after an excellent start, she broke down completely, owing to a crank-shaft breaking, and had to be towed to the shore. The "P.D.Q. III.," a new hydroplane, owned by Mr. A. Graham Miles, of New York, also competed.

SHIPBUILDING AT VANCOUVER.

IN the opinion of Sir Philip Watts, K.C.B., adviser on naval construction to the British Admiralty, who arrived in Vancouver, Sept. 29, warships of the larger classes could be built in Canada, but not as quickly or cheaply as they are turned out in England.

The best way, he declared, for Canada to start in on naval construction would be to have a few ships built in England at first and then have some built, partly in England and partly in Canada, and finally, when the workmen have been trained and the shipbuilding plants properly organized and equipped here, to build the ships altogether in Canada.

"Of course," he said, "the whole work could, no doubt, be done in Canada from the outset, but I think that the cost would be very great and the ships would take a much longer time to construct than is the case in England."

Building of the ships, however, he remarked, would not be the only thing that would have to be taken into consideration. There would be the machinery to build and instal, and the most important item of arming the ships when completed. At present Canada has not the facilities to do either of these things, he claimed.

Sir Philip Watts, K. C. B., F. R. S., Hon. LL.D., was born in 1850. He was educated at the College of Naval Architecture, and was a Constructor for the Admiralty until 1885, when he joined the firm of Armstrong, Whitworth & Co., and was in charge of the warship building department of that company. In 1901 he was offered and accepted the post of Director of Naval Architecture to the Admiralty, a position he filled until 1911, when he retired, and was appointed adviser to the Admiralty on Naval Construction. He is Chairman of the Federation of Shipbuilders. Sir Philip was created a knight in 1905 in recognition of his services to the Admiralty.

LINE NORTH TO SKAGWAY.

THE establishment of a steamship line by the White Pass and Yukon Route in conjunction with one of the big American railways, probably the Chicago, Milwaukee & St. Paul system, in order to provide the Northern Transportation Co., with a direct service between Seattle, Vancouver and Fairbanks, Alaska, early next year, and the eventual linking up of one of the American transcontinental railways with the Yukon and Alaska with the Pacific and Great Eastern and the Grand Trunk Pacific Railways are foreshadowed.

Although no definite information is forthcoming at present on the point the trend of the negotiations would seem to indicate that the proposed steamship line, which it is said on reliable authority, will be operated in conjunction by the W. P. & Y. R. and the Chicago, Milwaukee and St. Paul Railway, would establish a direct service by water between the present terminus of the Chicago, Milwaukee & St. Paul Railway and the White Pass and Yukon Route, which would be superseded later on by the proposed direct overland railway.

The Chicago, Milwaukee and St. Paul, as is generally known, plans to extend its system to Vancouver, where it is understood, it would connect with the Pacific and Great Eastern Railway and the Grand Trunk Pacific, and be linked up eventually with the White Pass line and the proposed links of the latter in Alaska and the Yukon.

SAFETY OF LIFE AT SEA.

MR. ALEXANDER JOHNSTON, Deputy Minister of Marine and Fisheries, has been appointed by the Government to represent Canada at the International Conference for Safety of Life at Sea to be held in London on November 12, 1913. Mr. Johnston will sail from Canada on October 28, 1913, and will be invested with full powers to sign any Convention which may be deemed necessary.

This conference is one of great importance, as the result of the investigations and inquiries consequent upon the Titanic disaster will be placed before it. The British Board of Trade, it is understood, will have important proposals to make, as will also the representatives of the other great shipping nations. It is probable that many of these proposals will be adopted by the Government of Canada acting in conjunction with the British Board of Trade.

The matter of adopting means to secure the greater safety of life at sea since the Titanic disaster and other accidents has been engaging the attention of the Dominion Government, through the Marine Department. Both the Hon. J. D. Hazen, Minister of Marine and Fisheries, and Mr. Johnston have studied the matter carefully. A list of questions bearing upon the safety of life at sea and upon better means to secure it was sent out by the Department recently to the shipping companies of Canada, which are co-operating heartily on the subject.

THE SPEED OF MOTOR BOATS.

PEOPLE who have seen that speeds of 48 and 49 knots were achieved by the motor boats which raced recently in the Solent for the British International trophy are, no doubt, wondering why in much bigger craft—destroyers, for example—ordinary shipbuilders and engineers cannot do correspondingly well. Of the seven vessels which took part in the contest two—Maple Leaf IV. and Disturber III.—are close upon 40 ft. long; two—Izme and Crusader—are 33 ft.; one—Ankle Deep—is 32 ft.; one—Despujols II.—is 29 ft. 6 in.; and one—Despujols I.—is 23 ft. The horse-power of Maple Leaf's two engines is 750, and that of Disturber's six engines is 600. Each of the French vessels is of 400 h.p., and Ankle Deep, Crusader and Izme are each of 300 h.p. The average speed of the slowest of the seven over a course of 32.4 sea miles was nearly 42 knots, and that of the smallest at her best was about 5 knots better.

These high speeds are, however, due to the fact that, without exception, the vessels are hydroplanes. Four of the seven are variations of the Fauber idea—multi-stepped skimmers—and three are variations of the idea first embodied by Sir John Thornycroft in Miranda III. Crusader is, however, the only true Thornycroft skimmer of the three, Despujols I. and Despujols II., although single-step vessels, being more like what the Americans call "sea sleds."

Unfortunately, the skimmer idea cannot be applied to much bigger vessels than Maple Leaf and Disturber, which are almost up to the 40 ft. limit prescribed by the trophy rules. M. Fauber and, if our memory serves, Sir John Thornycroft as well, have expressed the opinion that hydroplanes of more than 15 metres—50 ft. in length—are impracticable. Judging from the case of Brunhilde, that seems, however, to be an over-estimate. The limit is some way short of 50 ft., so that there is not any immediate chance of the Atlantic records being wrested from the Mauretania and the Lusitania by a leviathan skimmer. Moreover, people who incline to think that the Royal Navy ought to employ a hundred or so of Maple Leafs for scouting had better defer coming to definite decisions on the subject until they see next year's races for this trophy.

Maple Leaf's gear makes a pleasant sort of noise, and the Wolseley engine in Izme is comparatively silent, but the machinery of all the others, especially that of the French boats, make a dreadful racket, which would speedily discover them to an enemy.

The truth is that all these high-speed motor crafts are just boxes of engines, and of no utility otherwise than in races. The makers of the petrol engines certainly deserve a great deal of credit for the efficiency to which they have brought that type of internal-combustion engine, but the speed for which the vessels driven by them are best known is, it should not be overlooked, very largely due to the hull forms.—Syren and Shipping.

TESTING LARGE WATT-HOUR METERS.

THE testing of a large watt-hour meter is much more troublesome than that of a small watt-hour meter. The difficulties in making the test increase, perhaps, as the square of the load to be measured, if the difficulties may be regarded as being capable of numerical expression.

In the first place, the small flexible leads and wires of the small instrument are replaced by massive rigid bars or cables on the large instrument; so that it takes much more time to insert the testing apparatus in the circuit.

In the second place, any change in the geometrical disposition of bars or cables may alter the magnetic field at the tested instrument and thus affect its behavior. Moreover, owing to the large money value of the energy delivered by a large watt-meter, a higher degree of precision in its testing and checking is desirable. It thus comes about that the calibration of large watt-hour meters in place is an undertaking requiring considerable effort and care, even if their working loads are steady. If their working loads are rapidly fluctuating, as on a traction system, standard indicating watt-meters become unsuitable, and standard watt-hour meters are necessary.

The Foundrymen's Convention and Equipment Exhibition

This double function continues to grow in importance and popularity each succeeding year, and it is becoming increasingly apparent that its sphere of influence is widening out to an extent undreamt of by those originally responsible for the ventures. Operative foundrymen and foundry equipment manufacturers are to be congratulated upon the enthusiasm exhibited in the welfare of their old time craft, and upon their evident determination to keep going in the direction of still greater achievement.

CHICAGO was the Mecca of foundrymen and kindred trades representatives during the week of October 10 to 17, for not only were the Annual Conventions of the American Foundrymen's Association, the American Institute of Metals, and that of the Associated Foundry Foremen being held in the "Windy" City, but there was also installed in the International Amphitheatre there, the most comprehensive exhibit of foundry apparatus, equipment and accessories, supplemented by a varied and most modern machine tool display, yet gathered together under one roof in any part of the world.

That something surpassing the ordinary was anticipated was clearly evidenced by the registration record of each section. The Convention Headquarters of the Allied Foundrymen's Associations found location in the Hotel La Salle, and there from October 14 to 17, morning and afternon sessions were held, at which the reading of papers relative to the different spheres of the foundry industry and discussions thereon took place.

Convention Programme.

Tuesday, October 14, 10 a.m.—Joint session of American Foundrymen's Association, American Institute of Metals and the Associated Foundry Foremen.

Addresses of welcome and responses.

Reports of officers of the three Associations.

Reports of committees, American Foundrymen's Association.

2 p.m.—Joint session.

Address, "Apprenticeship System in the Metal Industries," by M. W. Alexander, Lynn, Mass.

Address, "How to Make a Time Study," by C. E. Koeppel, New York City.

American Institute of Metals:

Report of Official Chemist, by C. F. Woods.

Report of Bureau of Mines, by Dr. C. L. Parsons.

Report of Bureau of Standards, by G. H. Clamer.

Internal Strains in Bronze Castings, by J. E. Howard.

Work in Metals of the Bureau of Standards, by G. K. Burgess.

Nomenclature of non-ferrous alloys, by G. K. Burgess.

The Brass Foundry of the Future, by C. Powell Karr.

Wednesday, October 15, 10 a.m.—American Foundrymen's Association:

Gray Iron for Motor Car Castings, by H. B. Swan, Detroit, Mich.

Electric Steel Castings, by F. T. Snyder, Chicago.

Some Difficulties in Pouring Steel Castings, by R. A. Bull, Granite City, Ill.

The Pattern Shop as Related to the Steel Foundry, by E. R. Swanson, Granite City, Ill.

Some Observations on Miniature, or Detachable Open-hearth Furnaces, by W. M. Carr, Erie, Pa.

FOUNDRY AND MACHINE EXHIBITION, INTERNATIONAL AMPHITHEATRE, CHICAGO, 1913.

The Electric Furnace for Steel Castings, by Albert Hiorth, Christiania, Norway.

On the Influence of Changing the Composition of Malleable Cast Iron, by P. Rodigin, Berdiansk (Sea of Azow), Russia.

A Study of the Annealing Process for Malleable Castings, by E. L. Leasman, Boscobel, Wis.

Malleable Troubles, by Dr. Richard Moldenke, Watchung, N.J.

10 a.m.—Associated Foundry Foremen, annual meeting.

12 noon.—Luncheon to ladies at Marshall Field & Co.

2 p.m.—Complimentary performance to visiting foundrymen at Bismarck Garden.

2 p.m.—Theatre party for ladies.

Thursday, October 16.—10 a.m.—American Foundrymen's Association:

The Need of Standard Specifications for Cast Iron, by R. S. MacPherran, West Allis, Wis.

Memoranda on Automobile Cylinder Founding, by Robert Crawford, Detroit, Mich.

Core Test and Specifications, by H. M. Lane, Detroit, Mich.

Testing Molding Sands under Commercial Conditions, by Prof. E. A. Johnson, Boston, Mass.

Vital Points in Foundry Practice, by J. J. Wilson, Detroit, Mich.

The Carnegie Institute of Technology, by Dean C. B. Connelley, Pittsburgh, Pa.

"Put Your House in Order," by Frederic A. Parkhurst, M.E., Detroit, Mich.

The Need of a Common Sense Cost System for the Foundry, by E. W. Riker, New York City.

10 a.m.—American Institute of Metals:

Efficiency Engineering in the Foundry, by E. A. Barnes.

Scientific Management, by W. M. Corse.

Scientific Management, by F. A. Parkhurst.

How Scientific Management Works in Our Plant, by C. B. Bohn.

Core Room Economies, by O. F. Flumerfelt.

Boiling of Metals, by Dr. J. W. Richards.

2 p.m.—American Foundrymen's Association:

Iron, Where Does It All Go To? by D. C. Wilson, Newark, N.J.

On the Relative Value of Foundry Flour, with Simple Methods of Testing, by G. S. Evans, Lenoir City, Tenn.

Memoranda on Accident Prevention, by Thos. D. West, Cleveland.

The Use of Powdered Coal as Fuel, by W. S. Quigley, New York City.

Memorandum on the Centrifugal Blower for the Foundry, by Dr. Richard Moldenke, Watchung, N.J.

Oxy-acetylene Welding and Cutting, by W. S. Hoyt, Chicago, illustrated by lantern slides.

Unfinished and new business, election of officers, etc.

7 p.m.—Annual subscription banquet at the La Salle Hotel.

Friday, October 17.—10 a.m.—American Institute of Metals:

Producer Gas for Brass Melting, by E. F. Bulmahn.

Commercial Operation of the Hering Furnace, by G. H. Clamer.

Silver Plating and Spotting Out, by C. F. Burgess.

Fluxes for Soft Solders, by W. Arthur.

Aluminum Solders, by W. Arthur.

Approximate Melting Points of Some Commercial Alloys, by A. B. Norton and H. W. Gillett.

In succeeding issues of our journal, publication will be made of abstracts from the various Papers read; it will, therefore, be unnecessary to refer to these here, except in so far as an obvious trend in some features of foundry practice betterment appear to us as being more prominent than others.

Efficiency and Scientific Management naturally took a prominent place in the subject matter of a number of Papers read, and it is not assuming too much when we say that active and successful application of these up-to-date practices is becoming a feature in both large and small foundry plants, with resultant benefit to employer and employee.

The development of the automobile found expression in some of the Papers read; its call for light, strong, clean close-grained castings, etc., being the

NORTH BUILDING ANNEX, FOUNDRY AND MACHINE EXHIBITION.

signal to foundrymen and their associates that investigation and scientific systematic treatment of the molding and metallurgical sides of the craft are sine qua non of the future of that growing industry.

The Production of Steel Castings by the Electrical Process, the Malleable Casting Process, Oxy-Acetylene Welding, Apprenticeship Systems and the question of Industrial Education occupied, among others, a large place in the future betterment problems more or less in the forefront of present-day foundry practice.

A.F.A. Officers, 1913-1914.

The officers of the American Foundrymen's Association elected for the ensuing year were as follows:

President—Alfred E. Howell, Phillips & Buttorff Mfg. Co., Nashville, Tenn.

Vice-Presidents—R. A. Bull, Commonwealth Steel Co., Granite City, Ill.; H. A. Carpenter, General Fire Extinguisher Co., Providence, R.I.; S. B. Chadsey, Massey-Harris Co., Ltd., Toronto, Ont.; G. R. Lombard, Lombard Iron Works & Supply Co., Augusta, Ga.; T. L. Richmond, Buffalo Scale Co., Buffalo, N.Y.; T. W. Sheriff, Sheriff's Mfg. Co., Milwaukee, Wis.; J. J. Wilson, Cadillac Motor Co., Detroit, Mich.; Walter Wood, R. D. Wood & Co., Philadelphia.

Secretary - Treasurer — Dr. Richard Moldenke, Watchung, N.J.

A.I.M. Officers, 1913-1914.

For the American Institute of Metals the following officers were chosen:

President—G. H. Clamer, Ajax Metal Co., Philadelphia.

Secretary-Treasurer—W. M. Corse, Lumen Bearing Metal Co., Buffalo, N.Y.

Vice-Presidents—For rolling mills—W. H. Bassett, American Brass Co., Waterbury, Conn.; for Michigan and Ohio, F. O. Clements, National Cash Register Co., Dayton, Ohio; for Ontario and Western Canada, C. H. Ivey, Empire Mfg. Co., London, Ont.; for Quebec, Robert Job, Milton Hersey Co., Montreal, Que.; for Pennsylvania, Jesse L. Jones, Westinghouse Electric & Mfg. Co., East Pittsburg, Pa.; for New England, Dr. E. Weintraub, General Electric Co., West Lynn, Mass.; for Chicago and Wisconsin, Fred Moerl, Pullman Co., Chicago; for Illinois, exclusive of Chicago, Phillip Mueller, Decatur, Ill.; for New York and New Jersey, C. A. Finnegan, Empire Smelting Co., Depew, N.Y.; for Virginia and South, E. S. Fretz, Light Foundry & Mfg. Co., Pottstown, Pa.

H. W. Gillett was appointed chairman of the Programme Committee.

A.F.F. Officers, 1913-1914.

The officers of the Associated Foundry Foremen elected are as follows:—

President—S. V. Blair, Kalamazoo Stove Co., Kalamazoo, Mich.; Vice-President, H. M. Martin, Davis Foundry Co., Hornell, N.Y.; Secretary-Treasurer, Robert B. Thompson, Buffalo Pitts Co., Buffalo, N.Y.

Foundry and Machine Exhibition Co. Officers.

F. N. Perkins, President; R. S. Buch, vice-president; J. S. McCormick, treasurer; C. E. Hoyt, Secretary.

Directors:—R. S. Buch, A. Buch, Sons Co., Elizabethtown, Pa.; F. N. Perkins, Arcade Mfg. Co., Freeport, Ill.; George R. Rayner, The Carborundum Co., Niagara Falls, N.Y.; J. S. McCormick, J. S. McCormick Co., Pittsburgh, Pa.; E. H. Mumford, Mumford Molding Machine Co., 30 Church St., New York City; A. M. Frauenheim, Herman Pneumatic Machine Co., Zelienople, Pa.; Henry A. Pridmore, Henry E. Pridmore, Chicago, Ill.; H. R. Atwater, The Osborn Mfg. Co., Cleveland, Ohio.; Wilfred Lewis, The Tabor Mfg. Co., Philadelphia, Pa.; Edward A. Pridmore, International Molding Machine Co., Chicago, Ill.; J. W. Campbell, The Cleveland Wire Spring Co., Cleveland, Ohio; C. E. Hoyt, Lewis Institute, Chicago, Ill.

Next Year's Meeting Place.

At an informal meeting of the officers of the American Foundrymen's Association, the American Institute of Metals and the Associated Foundry Foremen, it was decided that future Conventions would be held in the Spring rather than in the fall—probably in May.

Since the annual meeting has been shifted to the fall instead of the spring, the securing of Papers for the meetings has become more difficult, due to the fact that members will not write them during their vacation time.

The Foundry and Machine Exhibition Co. has not yet decided whether it will have its exhibition in the fall next year, or whether it will follow the practice of having it at the same time and place as the Foundrymen's Association Conventions.

PART OF THE MACHINE TOOL EXHIBIT, FOUNDRY AND MACHINE EXHIBITION.

The cities sending special invitations to the Associations were Nashville, Chattanooga, New York, Philadelphia, Kansas City, St. Paul, Denver, Atlantic City and Columbus.

Presentation.

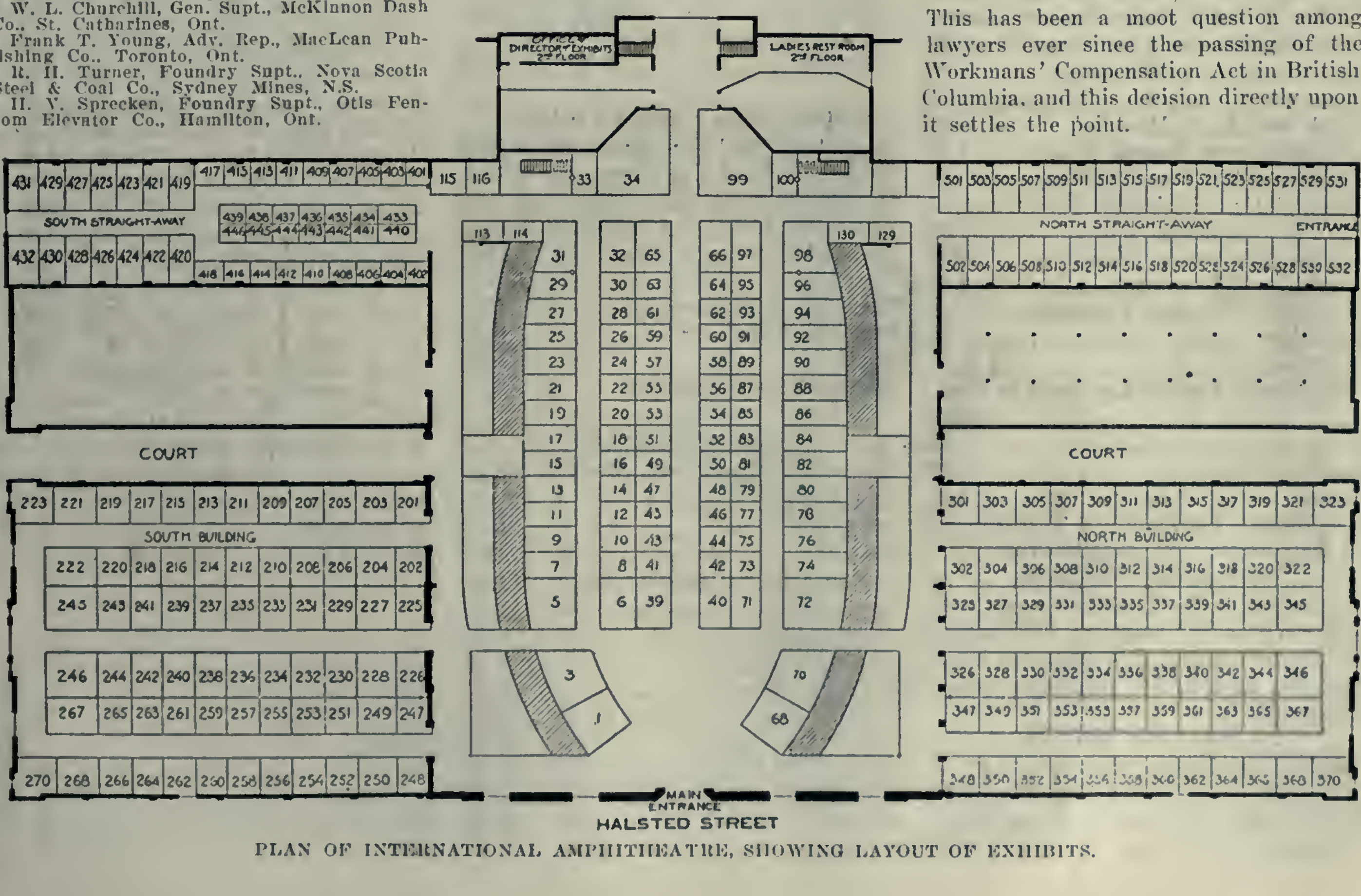
The newly elected president, on behalf of the Convention, presented J. S. Seaman, of Pittsburgh, the oldest living ex-president of the Association and the "daddy" of the crowd, with a beautiful silver pitcher and tray. A number of goodfellowship speeches followed.

As in former years the local committees bore a large part in the successful outcome of the joint function of Convention and Exhibition, and in this connection, the chairman of the local executive, Mr. Chas. A. Plamondon, the chairmen of the Entertainment, Reception, Finance, Publicity and Ladies' Committees, are deserving of special mention, and while the secretarial work of the Foundrymen's Association, and that of the Foundry & Machine Exhibition Co., keeps piling up, there is abundant evidence that the officers in these positions —Dr. Richard Moldenke and Mr. C. E. Hoyt, always rise to the occasion, and look good for the inevitable extension of their respective undertakings, for many years to come.

The Canadian Delegation.

J. A. Meuris, Iron Foundry Foreman, Jenkins Bros., Montreal, Que.
Ed. Halley, Purch. Agent, Lymburner, Ltd., Montreal, Que.
A. Knight, Fdry. Supt., Manitoba Bridge & Iron Works, Winnipeg, Man.
W. L. Churchill, Gen. Supt., McKinnon Dash Co., St. Catharines, Ont.
Frank T. Young, Adv. Rep., MacLean Publishing Co., Toronto, Ont.
R. H. Turner, Foundry Supt., Nova Scotia Steel & Coal Co., Sydney Mines, N.S.
H. V. Sprecken, Foundry Supt., Otis Fensom Elevator Co., Hamilton, Ont.
P. A. Vansickle, Designer, Verity Plow Works, Brantford, Ont.
W. J. Verity, Gen. Mgr., Verity Plow Works, Brantford, Ont.
John W. Battershill, Supt., Vulcan Iron Works, Winnipeg, Man.
J. M. Taylor, Supt., Western Steel & Iron Works, Elmwood, Winnipeg, Man.
W. R. Gilmore, Manager, Canadian Steel Foundries, Welland, Ont.
F. E. Smith, Mgr., Canadian Steel Foundries, Montreal, Que.
Geo. M. Weaver, Mgr. Dominion Foundry Supply Co., Montreal, Que.
A. Earsman, Mgr., Earsman Bros., Toronto, Ont.
A. J. Palmer, Supt., Empire Mfg. Co., London, Ont.
C. M. Ivey, Sec., Empire Mfg. Co., London, Ont.
J. B. Walton, Supt., McClary Mfg. Co., London, Ont.
M. F. Irwin, Mgr., McClary Mfg. Co., London, Ont.
A. J. Oliver, Mgr. and Sec., R. McDougall Co., Galt, Ont.
S. B. Chadsey, Asst. Gen. Supt., Massey-Harris Co., Toronto, Ont.
A. H. Byrne, Chicago Rep., MacLean Publishing Co., Toronto, Ont.
R. Cecil Cowan, Purch. Agt., Ontario Malleable Iron Co., Ltd., Oshawa, Ont.
J. R. Phillips, Supt., Pease Foundry Co., Toronto, Ont.
J. G. McKinnon, Sec., Pease Foundry Co., Toronto, Ont.
P. J. Vernon, Supt., Pratt & Letchworth Co., Ltd., Brantford, Ont.
A. Chase, Foreman, Sawyer-Massey Foundry, Hamilton, Ont.
Arthur Woodley, Mgr., Standard Foundry, Toronto, Ont.
Jno. M. Taylor, Jr., Asst. to the Pres., R. Saville, Supt., A. R. Hocken, Supt., and Capt. J. S. Taylor, Mgr., Boiler Dept., Taylor-Forbes Co., Guelph, Ont.
T. Tomlinson, Prop., Tomlinson & Son, Toronto.
F. W. Armstrong, Mgr., Toronto Brass Mfg. Co., Toronto, Ont.
J. Van Iderstein, Foreman, and C. F. Verity, Vice-Pres., Verity Plow Co., Brantford.
J. Poulson, Pattern Maker, and J. Robinson, Fdry. Foreman, Warden-King, Ltd., Montreal, Que.
W. D. Varey, Vice-Pres., J. J. Cunningham, Pres. and Gen. Mgr., Western Foundry Co., Ltd., Wingham, Ont.
A. L. F. Beauchemin, Mgr., Beauchemin & Fils, Sorel, Que.
T. K. Smith, Supt., Big Four Trans. & Storage Co., Winnipeg, Man.
Hugo A. Gutenkunst, Pres. and Treas., Can. Malleable Iron Co., Owen Sound, Ont.
Robt. Gordon, Supt., Canada Mach. Corp., Galt, Ont.
Albert Beauchemin, Mgr., Dominion Foundry, Sorel, Que.
John A. Kittilson, Res. Mgr., the E. & T. Fairbanks & Co., Sherbrooke, Que.
T. W. Kirdy, Mgr., and A. C. Spencer, Works Mgr., Hamilton Stove & Heater Co., Hamilton, Ont.
Rupert G. Bunce, Mgr., Manson & Van Winkle Co., Toronto.
Wm. Inglis, Managing Director, John Inglis Co., Toronto, Ont.
Chas. Linklater, Foreman, International Harvester Co., Hamilton, Ont.
J. F. Gramp, Pres., National Brass Co., London, Ont.
V. C. Writtenhouse, Fdry. Foreman, Sawyer-Massey, Ltd., Co., Hamilton, Ont.
W. Quinn, Foreman, M. Callander, Foreman, and Adam Taylor, Treas., Taylor-Forbes Co., Ont.
Robert Dawe, Foundry Supt., Can. Car & Foundry Co., Ltd., Montreal, Que.
C. E. Rohder, Vice-Pres. and Asst. Mgr., F. Bowman Co., Bowmanville, Ont.
A. Knight, Foundry Supt., Manitoba Bridge & Iron Co., Winnipeg, Man.
D. McKinnon, Gen. Foreman, Montreal Steel Works, Montreal, Que.
R. Wilson, Works Mgr., Otis Fensom Elevator Co., Ltd., Hamilton, Ont.
R. Morton Hamilton, Asst. Supt., and Jas. M. Smith, Supt., Sheldons, Ltd., Galt, Ont.
Allen Murray, Foreman, Jas. Smart Mfg. Co., Brockville, Ont.
J. C. King, Pres., and Frank E. Lauer, Works Supt., Warden King, Ltd., Montreal, Que.
W. G. Harris, the Canada Metal Co., Toronto, Ont.
D. Maxwell, Pres., D. Maxwell & Sons, St. Mary's, Ont.

Vancouver, B.C.—Judge McInnes, on October 15, decided in the case of Mrs. Hill against the Victoria Lumber Co., that a logging camp was neither a "factory" nor "engineering works," as defined by the Workmans' Compensation Act. The effect of this decision is that no one injured in a logging camp can claim compensation, nor relatives of the man in case of death, under this Act. This has been a moot question among lawyers ever since the passing of the Workmans' Compensation Act in British Columbia, and this decision directly upon it settles the point.



PLAN OF INTERNATIONAL AMPHITHEATRE, SHOWING LAYOUT OF EXHIBITS.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

	Mont'l.	Tor'to.
Grey Forge, Pittsburg.	.....	14 30
Lake Superior, charcoal, Chicago	.....	15 25
Middlesboro, No. 3....	20 00	21 50
Carron, special	22 50	.....
Carron, soft	22 50	.....
Cleveland, No. 3......	20 00	22 00
Clarence, No. 3	20 00	21 00
Jarrow	.....	23 50
Glengarnock	.....	26 00
Michigan charcoal iron	27 00	.....
Ferro Nickel pig iron (Soo)	.....	25 00
Foundry No. 1, Port Colborne	.....	18 00
Foundry No. 2, Port Colborne	.....	17 50
Canadian Foundry No. 1	19 15	.....
Canadian Foundry No. 2	18 65	.....

BILLETS.

	Per Gross Ton.
Bessemer billets, Pittsburgh ...	$23 00
Open hearth billets, Pittsburgh.	23 00
Forging billets, Pittsburgh.....	27 00
Wire rods, Pittsburgh	26 50

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto..	2.10
Steel bars, f.o.b., Toronto.......	2.15
Common bar iron, f.o.b., Montreal.	2.10
Steel bars, f.o.b., Montreal........	2,20
Bessemer rails, heavy, at mill....	1.25
Steel bars, Pittsburgh, future	1.40
Tank plates, Pittsburgh, future...	1.35
Beams, Pittsburgh, future........	1.40
Angles, Pittsburgh, future........	1.40
Steel hoops, Pittsburgh...........	1.60
F.O.B., Toronto Warehouse.	**Cents.**
Steel bars	2.25
Small shapes	2.35
Warehouse, Freight and Duty to Pay.	**Cents.**
Steel bars	1.80
Structural shapes	1.90
Plates	1.90

Freight, Pittsburgh to Toronto.

18 cents carload; 21 cents less carload.

IRON PIPE FITTINGS.

Canadian malleable, 40 per cent.; cast iron, 65; standard bushings, 70; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 75; malleable, lipped unions, 65.

NAILS AND SPIKES.

Standard steel wire nails, base..		$2 35
Cut nails	$2 60	2 65
Miscellaneous wire nails.. 75 per cent.		
Pressed-spikes, ⅝ diam., 100 lbs. .		2 85

BOILER PLATES.

	Mont'l.	Tor'to.
Plates, ¼ to ½ in., 100 lbs.	$2.35	$2.30
Heads, per 100 lbs.........	2.65	2.65
Tank plates, 3-16 in.......	2.60	2.40
Tubes, per 100 ft., 1 inch	9.50	8.50
" " 1¼ in.	9.50	8.50
" " 1½ "	9.50	9.00
" " 1¾ "	9.50	9.00
" " 2 "	8.75	8.75
" " 2½ "	11.15	11.50
" " 3 "	12.10	12.50
" " 3½ "	14.15	14.50
" " 4 "	18.00	18.00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Stove bolts	80 & 7½
Machine bolts, ⅜ and less	65 & 5
Machine bolts, 7-16......	57½
Blank bolts	57½
Bolt ends	57½
Machine screws, iron, brass	35 p c.
Nuts, square, all sizes.....	4c per lb off
Nuts, Hexagon, all sizes..	4¼ per lb off
Fillister head	25 per cent.
Iron rivets	60, 10 p c off
Wood screws, flathead, bright	85, 10, 7½ p c off
Wood screws, flathead, brass	75, 10, 7½ p c off
Wood screws, flathead bronze	70, 10, 7½ p c off

National-Acme "Milled Products."

Sq. & Hex Head Cap Screws	65 & 10%
Sq. & Hex Head Cay Screws	65 & 10%
Rd. & Fil. Head Cap Screws	45-10-10%
Flat & But. Head Cap Screws	40-10-10%
Finished Nuts up to 1 in. ..	75%
Finisbed Nuts over 1 in. ..	72%
Semi-Fin. Nuts, up to 1 in...	75%
Semi-Fin. Nuts over 1 in.....	72%
Studs....	65%

Discounts f.o.b., Montreal.

OLD MATERIAL.

Dealers' Buying Prices.	Mont'l.	Tor'to.
Copper, light	$10 50	$11 50
Copper, crucible	14 00	14 50
Copper, uncr'bled, heavy	13 00	12 50
Copper wire, uncrc'bled	12 50	12 50
No. 1 machine compos'n.	11 00	12 50
No. 1 comps'n turnings..	9 50	9 50
No. 1 wrought iron	10 00	9 00
Heavy melting steel ...	8 50	10 00
No. 1 machinery cast iron	13 00	14 00
New brass clippings....	8 50	9 00
No. 1 brass turnings....	7 25	8 00
Heavy lead	3 75	4 25
Tea lead	3 00	3 20
Scrap zinc	3 00	3 50

WROUGHT IRON PIPE.

The following are Toronto jobbers' discounts on pipe in effect from April 21, 1913:

	Buttweld		Lapweld	
Standard	Black	Gal.	Black	Gal.
¼ ⅜ in.	64	49	....	....
½ in.	68	58	....	....
¾ to 1½	73	63	....	....
2 in.	73	63	69	59
2½ to 3 in. ..	73	63	72	62
3½ to 4 in. ..	71½	61½	70½	60½
4½ to 6 in. ..	....	....	71½	61½
7, 8, 10 in. ..	....	....	66	54
X Strong P. E.				
¼, ⅜ in......	56½	46½	....	....
½ in.	64	54	....	....
¾ to 1½ in. ..	68	58	....	....
2 to 3 in.	69	59	....	....
2½ to 4 in ...	....	....	66	56
4½ to 6 in. ..	....	....	64	56
7 to 8 in.	....	....	55	45
XX Strong P. E.				
½ to 2 in.	43	33	....	....
2½ to 4 in. ..	....	....	43	33

PRICES OF WROUGHT IRON PIPE.

Standard.		Extra Strong.		D. Ex. Strong.	
Nom. Diam.	Price. per ft.	Sizes Ins.	Price per ft.	Size Ins.	Price per ft.
⅛in	$ .05½	⅛in	$ .12	½	$ .32
¼in	.06	¼in	.07½	¾	.35
⅜in	.06	⅜in	.07½	1	.37
½in	.08½	½in	.11	1¼	.52½
¾in	.11½	¾in	.15	1½	.65
1 in	.17½	1 in	.22	2	.91
1¼in	.23½	1¼in	.30	2½	1.37
1½in	.27½	1½in	.36½	3	1.86
2 in	.37	2 in	.50½	3½	2.30
2½in	.58½	2½in	.77	4	2.76
3 in	.76½	3 in	1.03	4½	3.26
3½in	.92	3½in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4½in	1.27	4½in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.86	...	.....
7 in	2.38	7 in	3.81	...	.....
8 in	2.50	8 in	4.34	...	.....
8 in	2.88	9 in	4.90	...	.....
9 in	3.45	10 in	5.48	...	.....
10 in	3.20	....	.....	...	.....
10 in	3.50	....	.....	...	.....
10 in	4.12	....	.....	...	.....

METALS.

	Mont'l.	Tor'to.
Lake copper	$17.25	$16.25
Electrolytic copper	17.25	16.25
Casting copper	17.00	16.00
Spelter	5.40	5.50
Tin	42.00	41.50
Lead	5.50	5.15
Antimony	8.50	9.00
Aluminum	22.00	18.00

SHEETS.

	Mont'l.	Tor'to.
Sheets, black, No. 28	$2.85	2.90
Canada plates, ordinary, 52 sheets	2 90	3 00
Canada plates, all bright.	4 00	4 15
Apollo brand, 10¾ oz. (American)	4 30	4 20
Queen's Head, 28 B.W.G.	4 40	4 40
Fleur-de-Lis, 28 B.W.G..	4 20	4 25
Gorbal's Best Best, No. 28	4 40	4 40
Viking metal, No. 28....	4 40	4 40

MISCELLANEOUS.

	Cents
Putty, 100 lb drums	$2.70
Red dry lead, 5 cwt. casks, per cwt.	6.00
Glue, French medal, per lb	0.10
Tarred slaters' paper, per roll...	0.95
Motor gasoline, single bbls., gal..	0.26
Benzine, per gal.	23½
Pure turpentine	0.60
Linseed oil, raw	0.60
Linseed oil, boiled	0.63
Plaster of Paris, per bbl.	2.10
Plumbers' Oakum, per 100 lbs....	3.25
Pure Manila rope	17

COKE AND COAL.

Solvay Foundry Coke	$5.95
Connellsville Foundry Coke	5.80
Yough, Steam Lump Coal	3.88
Penn. Steam Lump Coal	3.68
Best Slack	2.99

All net ton f.o.b. Toronto.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents.

Montreal, October 27, 1913.—Generally speaking, trade conditions may be said to show an improved tone over last week, particularly in the machine tool line. This is the more gratifying, as machinery brokers have not been getting the amount of business that might have been expected during the past month or two. Last week, the Canadian Allis-Chalmers Co. secured a nice order for turbine pumps for the Abitibi Pulp and Paper Co., while Mussens, Limited, sold about $12,000 worth of machine tools to the Dominion Dredging Co., who are erecting a very fine repair shop at Port Welland in connection with their work on the new Welland canal.

The large machinery houses here are looking forward to an early issuing of specifications for the equipment for the new shops of the National Transcontinental Railway at St. Malo, near Quebec. Work on these shops has now commenced and the specifications for the equipment may be expected any time now. There will, of course, be a large sum of money involved and doubtless competition for the orders will be keen.

Metals.

Business in pig iron continues brisk. First deliveries from the new furnace at Port Colborne, Ont., are now arriving and will doubtless be given a careful try-out in local foundries.

The price of copper shows a slightly firmer tendency, but the market in this metal, and also in tin and lead, is very dull.

Toronto, Ont., Oct. 28, 1913.—The local market for structural steel is reported to have been considerably disturbed this week owing to the action of certain structural shops in disposing of surplus stocks at lower than the market price, their object being to get back the money paid for this commodity, and to reduce stock. Local dealers have been cutting prices on structural steel five cents a pound for desirable business. Steel bars are selling at 2.25 and small shapes at 2.35, f.o.b., Toronto warehouse. For small orders 2.30 and 2.40 are being charged. New specifications have begun to appear, mainly from contractors whose money for contracts is coming in, and from others on whom the bank has taken pity and allowed them money to go ahead with their jobs. The implement people are also buying steel for Western goods. Farming machinery is being manufactured and shipped to Western representatives with the understanding that no interest shall accrue on machinery sold until November, 1914. Thus the implement men have absolute faith that the season will be good for Western business, but at the same time are sure that they will get no money until after next summer. Steel bars in Pittsburgh are 5 cents higher than structural steel and plate, which is unprecedented. As a rule it is the other way around. The demand for sheets is not heavy, but is improving, principally from the stove people. Several engineering shops in the city have secured good contracts, and have placed orders for steel. On the whole, however, dealers are looking forward to the quietest season for five or six years. The Eagle and Globe Steel Co., a Sheffield firm, with offices on Front Street, have not suffered much from depression, but are not rushing. Manufacturers of wrought iron pipe have revised their prices, the discounts on smaller sizes being increased considerably. A full list of changes will be found among the selected market quotations. Wrought iron pipe makers have found business slack for the past two or three months, but are busier now, Western dealers having ordered supplies to be rushed through before navigation closes.

Metals.

Copper is down in New York, and English prices are up for spot delivery, but futures are down. Visible supplies are a little greater. Prices in Toronto remained the same. Spelter is down, also tin to $41.50 from $43.00. The metal business is very poor.

MACHINERY HALL, CANADIAN NATIONAL EXHIBITION.

THE Bawden Machine Co., general engineers and pumping machinery manufacturers, Stirling Road, Toronto, give expression to their views, regarding the proposal for a new machinery hall at the Canadian National Exhibition, Toronto, in the following letter:

Your letter of September 12, re above, received and we are glad to know that some person is taking the initiative in this matter. We were very anxious to make a large exhibit at the Canadian National Exhibition this year, having just put a new pump on the market different from any ever made in this country. The engineers and those interested in steam pumps were very anxious to see it in operation, and we advised them we would have them running at the Exhibition, but when we had our space allotted, we found all we could get was about 16 feet, in a corner, and as this would not accommodate more than one pump with room to get around it, we had to abandon the idea of exhibiting altogether after going to a good deal of trouble to get the pumps ready in time. We think that if a new machinery hall is put up, there should be means of getting steam for steam operated apparatus, as engineers are anxious to see anything new in operation, and the Exhibition authorities are a long way out in their ideas to think that hydro-electric has displaced steam altogether.

We trust your efforts will bear fruit, and that by next year there will be a Machinery Hall at the Canadian National Exhibition where the Canadian manufacturers can have a chance to make a decent exhibit.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Engineering

Rideau Junction, Ont.—A start has been made on the C.N.R. shops here.

Montreal, Que.—Metals, Ltd., 30 St. James St., contemplate the erection of a factory.

Fort William, Ont.—The Great West Fence Co., of Winnipeg, will erect a plant here.

Toronto, Ont.—The foundry of R. Bigley Co., Ltd., Macdonell Ave., was damaged recently by fire.

Montreal, Que.—The Steel Co. of Canada recently awarded contracts for its new nail factory here.

Toronto, Ont.— The Consumers' Gas Co. are making plans for further enlargement of their works.

Port Mann, B.C.—Work on the foundations of the C.N.R. roundhouse and car repair shops has begun.

Portage la Prairie, Sask.—A Port Huron firm of machinery manufacturers have secured a site for a plant.

Sydney Mines, N.S.—The Nova Scotia Steel & Coal Co. will instal a new coal washing plant at a cost of $35,000.

Lindsay, Ont.—The Lindsay Machine Works will build an addition to their machine shop and garage on William St.

Exeter, Ont.—The ratepayers have voted almost unanimously in favor of a loan of $10,000 to the Exeter Manufacturing Co., a new foundry concern.

Calgary, Alta.—The Lewis File & Rasp Co., Massillon, Ohio, plan to erect a branch factory at Calgary. Work on the building will commence early.

East Toronto, Ont.—The Toronto Railway Co. will erect an addition to their car barns on the Kingston Road section of the York Radial.

St. Marys, Ont.—C. Richardson & Co., makers of dairy machinery, are making an addition to their factory, four storeys high, 40 x 70 feet. Plans have been prepared.

Welland, Ont.—The Dominion Dredging Co. have begun the erection of a machine shop, round house, etc., preliminary to starting work on a big scale on the Welland canal.

Rimouski, Que.—Edward Curotte has opened a machine shop here to do repair work on steamers, gasoline yachts, saw mill and general mechanical engineering.

Port Arthur, Ont.—It is understood that one object of the visit to London of Sir Wm. Mackenzie and Mr. J. J. Carrick, M.P., is to raise ten million dollars for steel works at Port Arthur.

Stratford, Ont.—The Canadian General Electric Co. will spend $25,000 on an addition to the plant of the Stratford Mill Bldg. Co. recently purchased by the above firm. J. L. Youngs, Stratford, contractors.

Hamilton, Ont.—John G. Gauld, K.C., announces that all contracts for the erection of the plant of the Hamilton Gas, Coke & By-Product Co. have been let, and that the plant will be completed by the first of October next.

Quick Removable Bar Cylinder Co., Ltd., incorporated at Ottawa, capital $500,000, to purchase and take over that certain invention known as a Detachable Bar Threshing Cylinder, invented by W. E. Leavell, at Redcliff, Alta.; Incorporators: William De Hale, John M. Tinnall, etc., Medicine Hat, Alta.

Uxbridge, Ont.—The Uxbridge Foundry Co., Ltd., has been incorporated at Toronto, capital $40,000, to carry in a general foundry, contracting, carpentry, joinery and decorating business, at Toronto. Provisional directors: William S. Thomas, William J. Mitchell, Robert J. Christie, George H. Constant, and William W. Cole, Toronto.

Medicine Hat, Alta.—Several carloads of steel have arrived at Medicine Hat for the building of the Saskatoon Bridge & Iron Co., Ltd., plant. As yet the railway spur to the site has not been completed, but in the meantime the steel is being hauled there so that the framework of the new structures can be proceeded with before the cold weather sets in.

Mesta Machine Co.—The report that the Mesta Machine Co., Pittsburgh, will build a plant in Canada is incorrect. It has simply arranged with a company at Bridgeburg, Ont., to manufacture for it some machinery on which the Mesta Machine Co. owns Canadian patents, and which the Canadian patent laws require to be manufactured in Canada.

Electrical

Lacombe, Alta. — The municipality will instal a twenty-five light electric system.

Woodville, Ont.—The sum of $4,000 will be expended on an electric distributing plant.

Westmount, P.Q.—The Corporation of Westmount have appropriated $25,000 for street lighting for the coming year.

Strathroy, Ont.—The Hydro-Electric Commission will supply Strathroy with 200 h.p. at $44 per h.p. for a 24-hour service.

London, Ont. The London Street Railway Co. will take power from the city, a satisfactory price having been agreed upon.

Winnipeg, Man.—The city will ask the ratepayers for $1,000,000 to be spent on a power plant, and $85,000 for an incinerator.

Smithers, B.C.—J. L. Hamilton and J. Fraser have selected a site on which they will erect an electric light plant and waterworks.

Smithville, Ont.—H. Gracey, furniture dealer, will purchase gasoline engine storage batteries and generator for 1,000 c.p. electric light.

Edmonton, Alta.—Plans and specifications will be prepared for an extension to the civic power plant. and tenders called for at an early date.

Outlook, Man.—The town has passed the following:—$10,000, municipal rink; $10,500 for electric light extension; and $3,500 for waterworks extension.

Toronto, Ont.—The City Hydro-Electric Commission will issue from $1,000,000 to $2,000,000 additional bonds to extend the system.

Windsor, Ont.—The city council has taken up the question of buying the street railway to ensure the success of the Hydro-Electric plant from the start, by stopping competition.

St. Hyacinthe, Que.—The town council have granted the electric lighting and power privilege to Clarence McCuaig & Co., of Montreal. This is a thirty-year franchise.

Windsor, Ont.—J. M. Goodall, who is in charge of construction work on the

transmission line from St. Thomas to Windsor, says power should be turned on by next winter.

Swift Current, Sask.— The Gillstrom Contracting Co. have been awarded a contract by the city to build a power house. Geo. D. Mackie, engineer.

North Battleford, Sask.—The city will investigate the posibilities of developing power three miles west of the city on the North Saskatchewan river. It is believed 40,000 h.p. can be generated.

Kingston, Ont. — The Corporation have decided to construct a system of underground conduits upon four of the principal streets, abolishing the unsightly poles.

Toronto, Ont.— The Canadian Stewart Co. who have the $10,000,000 contract for dredging the harbor will use electricity to operate their machinery where possible and if not too costly.

Owen Sound, Ont.—The Hydro-Electric plans for a plant at Eugenia Falls have been approved by the Electric Light and Power Committee of the town council, and a by-law will be drafted.

Brantford, Ont.—A plan to develop 2,500 horse-power at Mohawk Lake to take care of its peak load in Brantford is under consideration by the Dominion Power & Transmission Co.

Morrisburg, Ont.—The Hydro-Electric Power Commission is generating power from a power house owned by the municipality. Prescott, Morrisburg, Winchester and Chesterville will be supplied.

Weston, Ont.—Weston Electric Light Commission have decided to sell electric supplies to the residents of the municipality. Dr. E. F. Irwin and Secretary A. Pearson have been appointed to make the purchases.

Sherbrooke, Que. — The Sherbrooke Railway & Power Co. have purchased from C. E. Kennedy, of Coaticook, the electric lighting franchise of Ayer's Cliff, Que. This includes light and power and the franchises for street lighting for a term of years.

Chatham, Ont.—The Hydro Commission will be asked to assist the city council in valuing the electric department of the Chatham Gas Company, with a view to the city purchasing it for use in distributing power to Chatham consumers.

Souris, Man. — The town has just closed a contract for a large $4,000 electric light plant. The contract has been awarded to the Accumulator Lighting Co., Winnipeg, who will instal one of its storage battery systems. The town will be lighted with ornamental five light clusters.

London, Ont.— The ratepayers have voted in favor of electrifying the London and Port Stanley Ry., a municipally owned line, at a cost of $700,000. A commission of five will be named to manage the work, and the following will probably be appointed: Mayor Graham, Hon. Adam Beck, Philip Pocock, Lt.-Col. W. M. Gartshore, and M. O. Fraser, K.C.

Hamilton, Ont.—The Dominion Power and Transmission Co. have completed plans for an auxiliary steam power plant at the foot of James street, to develop 27,000 h.p., costing $1,250,000. W. C. Hawkins, managing director, is authority for this statement. Provision will be made for the addition of units reaching a maximum of 90,000 horsepower in later years, which will entail an outlay of $3,500,000.

General Industrial

Toronto, Ont.—Gunns, Ltd., Toronto, plan to erect a fertilizer factory to cost about $25,000.

Montreal, Que.—The Laurentide Co., Grand Mere, Que., are planning the installation of additional paper machines.

Blairmore, Alta. — The Keystone Cement Co. with a plant worth $600,000 has begun operations. Another $100,000 will be spent.

Bridgeburg, Ont.— Mentholatum Co. are building a factory costing $20,000. Turner Construction Co., Buffalo, contractors.

Glace Bay, N.S.— A hospital to cost $60,000 is planned by the General Hospital Board. Architect, Geo. Beckwith, Sydney, N.S.

Winnipeg, Man.—The J. R. Watkins Medical Co. will build a factory and warehouse here. Paul Watkins is president and the head office is at Wyoming, Minn.

Coquitlam, B.C.—The Port Haney Brick Co. recently installed a 150 h.p. boiler costing $2,500, and a new dry pan. Other improvements are under way. Prospects are reported to be good.

Sherbrooke, Que.—The Elbram Stone Co., makers of artificial marble, floor tiles, and various cement products, with a capital of $100,000, have applied to the city for a site, exemption, and power at minimum rates. They will erect a brick plant 150 x 50 feet, and instal machinery costing $10,000.

Toronto, Ont.—The Dominion District Steam Heating plant have asked the Board of Control for power to lay pipes in the streets, and co-operate with the Hydro-Electric. The company is a subsidiary of the American District Steam Heating Co., of Lockport, N.Y., and has a capital of $100,000, which may be increased to $2,000,000 if permission is given. J. R. L. Starr, Toronto, is the firm's solicitor.

Wood-Working

Madoc, Ont.—This town is to have a new planing mill and builders' supplies factory.

Lake Megantic, Que.— The building of the broom factory by P. Cliche is progressing rapidly.

Scotstown, Que.—The new chair factory has started operation. Several machines are now running.

Sarnia, Ont.— Sommers Bros., Saginaw, Mich., plan to erect a match factory here, to cost about $30,000.

Souris, Man.—The Arnett Furniture Co., Ltd., will increase the capacity of their plant. The necessary capital is being raised, and work will start next spring.

Trade Gossip

O'Brien, Doughny, Quinlan & Robertson, contractors for section No. 3, the principal section on the new Welland Ship Canal, are opening offices on Chappel Street, Welland.

Transcona, Man.—The city council is objecting to a 13,000 volt. transmission line for the N.T.R. shops being strung through the streets on the ground that it is dangerous.

W. H. Bytham has resigned his position as manager of the Montreal branch of the Canadian Union Electric Co. to take up a directorship in the Electrical Repair & Contracting Co. in Montreal.

Canada May Suffer.—According to a London cable, Canada's situation under the new U.S. tariff is the subject of much comment there, and West Indies merchants admit that the provision of an alternative market will undoubtedly have effect in diverting to the United States a great deal of trade otherwise transacted with Canada under the new reciprocity agreement.

Brass Flange Standard.— An American standard for dimensions for brass flanges was adopted on September 17 by the Committee of Manufacturers on Standardization of Fittings and Valves,

The Value of Compressed Air Equipment in the Foundry*

By Arthur F. Murray, M.E. **

Compressed air and electricity are two prominent factors in the development and achievement of the foundry as we find it to-day, and each fills a distinct place as the motive power for the operation of the equipment installed. Foundrymen appreciate the new conditions under which work is now performed, and in the matter of what has contributed most largely to their improved status, the consensus of opinion favors compressed air.

THE foundryman is up against an ever-increasing cost per unit for raw materials and labor, and at the same time faces such brisk competition that he is forced to lower rather than increase his selling prices. Increased operating efficiency presents the only remedy. Labor is the largest single item of foundry expense, and the introduction of machinery makes possible large reductions in labor cost. Compressed air and electricity have become foundry necessities.

We seldom realize the importance of the role that compressed air has played in the tremendous industrial strides of the past generation. Without the shield and rock drill, the $150,000,000 tunnel and terminal of the Pennsylvania Railroad would have been impossible. Without the riveting hammer and caisson, there would exist scarcely a single skyscraper in our cities. In the foundry, the effects have been almost as great. The compressor, chipping hammer, sand rammer, moulding machine, sand-blast, sand riddle and air hoist, have become parts of every well organized foundry. It is impossible here to give a complete presentation of the subject in one short article, so an attempt will be made to deal with the least known applications of compressed air, passing over rapidly such items as chipping hammers, sand rammers and air hoists.

The Compressor Feature.

The foundry compressor must be as nearly as possible dirt-proof, and fool-proof. Compressors that stand up well in clean surroundings, with skilled attendants, frequently go all to pieces in the dustladen atmosphere of the foundry where the skilled attendants are conspicuous by their absence. Enclosed frame types, recently developed, vertical single-acting in small sizes and horizontal double-acting in larger sizes, meet a long felt need for foundry service.

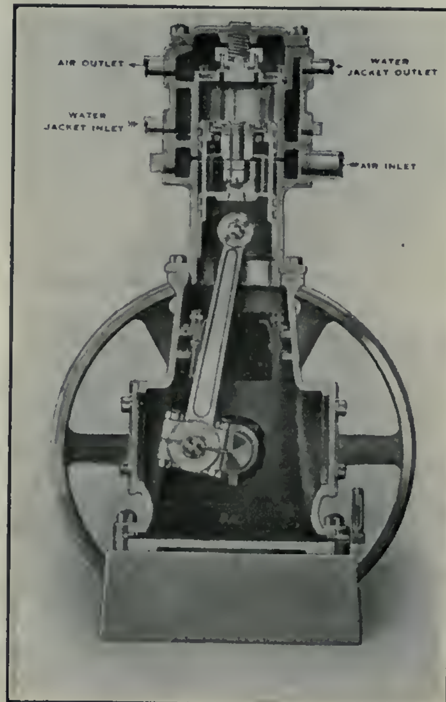


FIG. 2. SECTIONAL VIEW VERTICAL HIGH SPEED AIR COMPRESSOR.

Foundries may be divided into three classes:

(a)—The novelty foundry with light work and requiring air for operating a few vibrator machines and perhaps a small sand-blast. For these, a compressor of from 10 to 75 cu. ft. displacement is often sufficient.

(b)—The average jobbing foundry with from 5 to 20 tons daily output should have a compressor of from 200 to 500 cu. ft. displacement.

(c)—The large foundry may use up to 1,500 or 2,500 cu. ft. displacement.

Small Compressors.

The novelty foundry with a small air requirement has, until recently, found difficulty in obtaining a satisfactory compressor. The advent of the automobile has brought forth a number of machines for garage service in pumping up automobile tires. Some of these machines are admirably suited to novelty foundry work.

Fig. 1 shows a Clayton garage compressor close belted to electric motor, which has been applied to this service in a number of cases. It is arranged with automatic starting and stopping device, pressure tank, etc. In addition to being used as compressors, this type can be used as vacuum pumps. One of them is being used in the Blake-Knowles foundry for operating suction moulding machines of the "Bryan" type.

Fig. 2. shows a section from which the dust-proof, self-oiling construction is apparent. Removable bearing linings and light weight valves are important features. This type is furnished in single, duplex and triplex machines, up to 65 cu. ft. displacement.

Medium Sized Horizontal Compressors.

Fig. 3 shows a type of machine which has been developed particularly for foundry service. It is the horizontal, enclosed frame, splash-lubricated type.

*From a recent talk to the Philadelphia Foundrymen's Association.
**Equipment Engineer, the Blake & Knowles Steam Pump Works, East Cambridge, Mass.

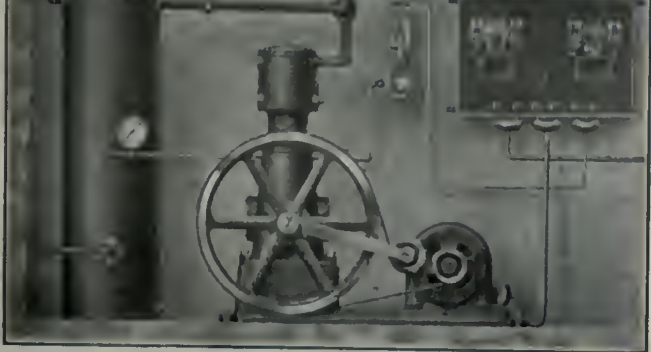


FIG. 1. AUTOMATIC AIR COMPRESSING EQUIPMENT.

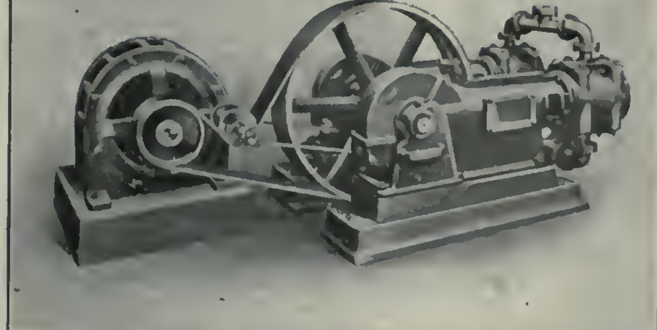


FIG. 3. DUPLEX ENCLOSED FRAME, SPLASH LUBRICATED AIR COMPRESSOR.

These machines are built both single and duplex, steam and power-driven. Fig. 3 shows a Clayton duplex compressor, motor driven by close belting with weighted idler. This method of drive is to be preferred to either chain or gear

FIG. 4. SINGLE ENCLOSED FRAME, POWER DRIVEN AIR COMPRESSOR WITH FRAME CAP REMOVED.

drive, and is now practically standard among the leading manufacturers.

Fig. 4 shows a single 12x8 Clayton machine with flywheels and crank cover removed, in which the splash oilers are seen, while Fig. 5 shows a cross section of a 10x10x10 steam-driven compressor also built by the Clayton Air Compressor Works, from which the general construction is noticed.

Fig. 6 shows the construction of the featherweight valves required for the efficient operation of compressors at high speed.

Two-Stage Compressors.

Fig. 7 shows a 16x10x10 duplex two-stage compressor with heavy belt wheel for connection to electric motor. Best practice demands pressure of 80 to 100 lbs. per sq. in. for the service lines of the foundry. Where the machine is to be motor driven with purchased power, the lower power consumption of the two-stage machine will soon make enough

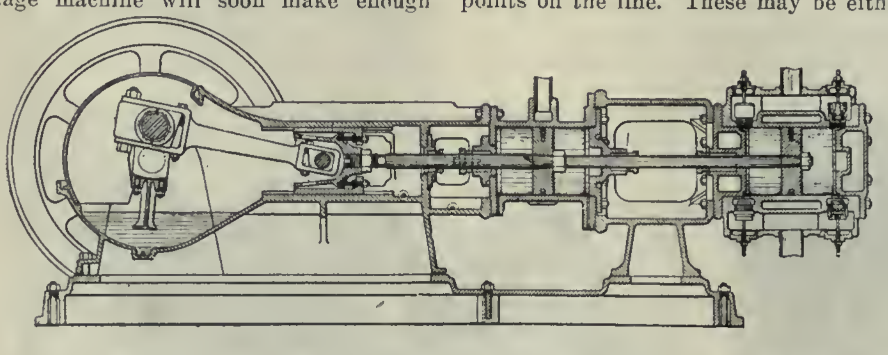


FIG. 5. SECTIONAL VIEW OF ENCLOSED FRAME SELF-OILING STEAM-DRIVEN AIR COMPRESSOR.

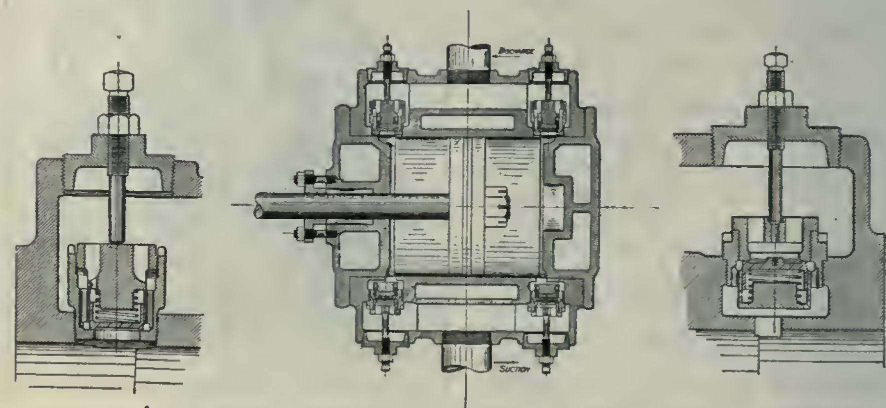
difference in the power bill to pay for the extra cost. Of course, the economy is not affected by the fact that the power is purchased, but the results are more effectively brought to the attention. The two-stage machine will run cooler and show a higher volumetric efficiency, i.e., ratio of piston displacement to actual cubic foot equivalent free air delivered. It will usually be found profitable at 80 to 100 lbs. air pressure where a displacement of 300 cu. ft. per minute or over is required, whether the machine is steam or power driven.

Fig. 8 shows an 11x17½x11x10 duplex two-stage Clayton compressor with Cincinnati valve gear on the low pressure cylinder. Volumetric efficiencies of from 90 to 95 per cent. are obtained at 100 lbs. pressure with this type of air valve gear.

Fig. 9 is a table showing horsepower and temperature for isothermal and adiabatic, single and multi-stage air compression which impresses the value of two-stage compression for the higher pressures.

Pipe Lines.

Piping should be as direct as possible



DISCHARGE VALVE. SECTION OF AIR CYLINDER. SUCTION VALVE.
FIG. 6. CLAYTON "FEATHERWEIGHT" AIR VALVES FOR HIGH SPEED AIR COMPRESSORS.

with no undrained pockets or loops where moisture can accumulate and where freezing can occur in cold weather. Separators should be installed at low points on the line. These may be either the ordinary type, similar to steam separators, or may be air receivers. It is a good plan to locate a steel receiver of 25 to 50 cu. ft. capacity at points where there is a large fluctuation in compressed air demands. This combines the action of separator and equalizer, although it will not sustain the service if the compressor shuts down. Fittings should be of the "long turn" type, and all shut-off valves of the gate type. All shut-off cocks on taps should be of heavy pattern and good quality. The piping should be installed with care to insure a tight line, and be well supported so that the joints cannot shake loose. A single ⅛-in. orifice will deliver 21.2 cu. ft. of free air per minute at 80 lbs. pressure, and the importance of preventing leakage is therefore readily seen. Hose should be heavy and preferably armored. Quick acting couplings should be supplied at both ends to prevent the reprehensible practice of twisting it up before screwing it into a tool connection.

Applications of Compressed Air.

Handling Materials.—Air hoists, pneumatic elevators, pneumatic cupola charging machines, fuel oil systems.

Core shop.—Core carriage hauling devices, core sand preparation (pneumatic riddles).

Molding floor.—Molding machines, plain jolt or jarring type, combination jarring and squeezing types, combination jolt ram and pattern drawing types, plain vibrator types, power squeeze types, power squeeze, power draft types; power squeeze, power rollover, power draft types; power sucker types with vibrator, pneumatic rammers, pneumatic molding sand sifters or riddles, plow guns, spraying devices.

Cleaning room.—Pneumatic chippers, sand blasts—high or low pressure, sand blast tumbling barrels.

A special form of pneumatic elevator is the cupola charging machine. There is a type for use where the charge requires no lifting, and a compound type in which the charge is both lifted and tipped by the machine. These devices are rapidly coming into favor.

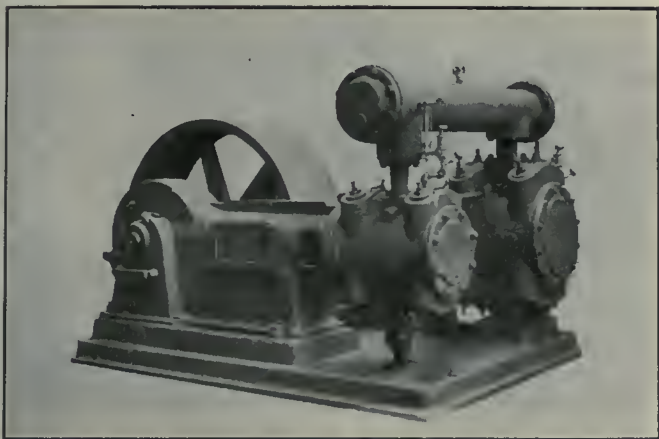


FIG. 7. HORZ. DUPLEX, ENCLOSED FRAME, BELT DRIVEN, TWO STAGE AIR COMPRESSOR, POPPET INLET VALVES ON LOW PRESSURE CYLINDER.

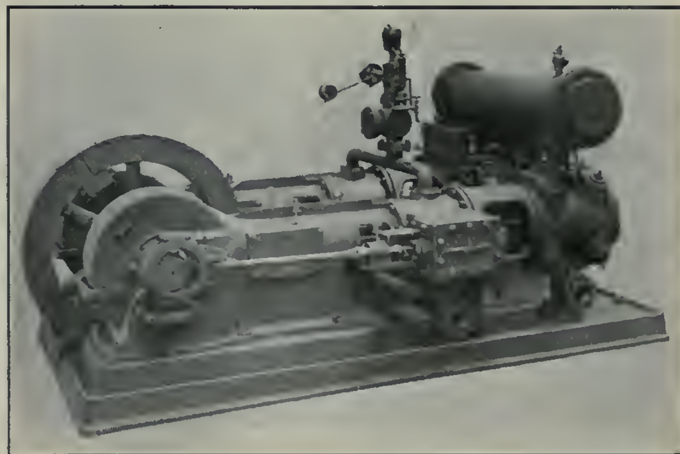


FIG. 8. DUPLEX ENCLOSED FRAME, TWO STAGE, STEAM-DRIVEN AIR COMPRESSOR.

A great many foundries use fuel oil for skin drying, melting furnaces, core ovens, etc. The air displacement system is a simple means of transporting this from the place of storage to the place of use. In this system, air is not applied directly to the storage tanks, but alternately to two small pressure tanks which receive their supply of oil by gravity from the main storage tanks. Simple crossover valves are used and changed over once or twice a day, usually by hand, but sometimes automatically.

The Core Room.

The handling of core carriages has always been a troublesome job. Fig. 10 shows a simple compressed air haulage device which is self-explanatory. The mixing of core sand by compressed air is frequently done by means of the pneumatic riddle shown in Fig. 11. The coreroom is often a neglected part of an otherwise up-to-date plant, therefore, opportunities for savings are usually good. If core costs can be sufficiently reduced, the entire molding practice may be radically changed, coring taking the place of difficult pockets, loose part work or multiple part flasks.

A large saving may be made by using "core jolt" machines. They make the manager smile, and the pattern-maker "holler." For success on the core jolt machines, boxes must be substantially built or they will be knocked to pieces, but the cost of a well-built core box is little more than that of a poorly built one, and the use of core jolt machines will reduce most core costs twenty-five to fifty per cent.

Pneumatic Molding Machines, Jarring Types.

One of the most remarkable changes in foundry practice during the past five years has been caused by the general adoption of the "pneumatic jarring machine," "jolt rammer," "bumper" or "bouncer," as it is variously termed by makers and users. No other single type of molding machine is applicable to as wide a range of operation or requires as little special pattern and flash work. The most remarkable thing about it all is that the jarring machine was invented in 1869, yet was forty years in coming into its own.

Fig. 12 shows a 16 in., 72 by 72 in. machine and a small corner of its molding floor in the Blake & Knowles foundry. Things to be noted are the electric jib crane and the air hoist installed especially for setting cores and finishing molds rammed on the jarring machine. The control valve and air pressure gauge will be observed alongside the wall. The hoists are in addition to the two overhead travelling cranes on the 200 ft. crane runway.

One of the most essential requirements for profitable operation of jarring machines is efficient crane service. Nothing will "show up" the crane service like the presence of a good-sized jarring machine on the hand molding floor. Inefficient crane service in a hand molding foundry, of course, means idle time for the molder, but he will usually not make much of a row about that. When the jarring machine comes in, the foreman and manager are watching it, and delays caused by the crane are quickly noted. In properly operating the jarring machine, molds are set up on the floor, clamped, picked up by the crane, carried to the machine and rammed, picked up again and turned over, and then carried to the finishing floor by the crane. In connection with the machine just illustrated, we have found it profitable to instal 5-ton independent high speed auxiliary hoists on each of the two 60-foot travelling cranes in this foundry, as well as to instal a 2-ton electric jib crane and an 8-inch air hoist.

Fig. 13 shows a bronze casting mould for one of the twin beam air pumps of the battleship "Nevada." This mould was rammed on a 7 ft. x 10 ft. jarring machine in our foundry (in dry sand), and the metal was melted in a Schwartz direct-flame furnace. Government requirements were met with more than 50 per cent. to spare—the tensile strength was 46,000 lbs. per square inch, and the elongation 31 per cent. More than one week's labor was saved on this job alone by use of the jarring machine.

Fig. 14 shows a three-part pattern with stripping plate for the check piece of the mould, arranged for ramming on a jarring machine. It is for a cast iron tank with walls about ½ in. thick, and with feet cast on the tank. In view of the oft-repeated statement that copes

Gage pressure, lbs.	15	40	80	100	150	300	450
Atmosphere	2.02	3.72	6.44	7.80	11.20	21.4	31.6
ISOTHERMAL—							
H.P. required per cu. ft. free air	.0481	.0843	.1196	.1320	.1547	.1970	.2230
H.P. per cu. ft. per minute	.0505	.104	.16	.182	.226	.317	.381
SINGLE STAGE—							
Efficiency compared to Isothermal	.90	.81	.74	.73	.69	.62	.58
Final temperature Fahr. Perfect intercooling Adiabatic compression	178	302	432	485	589	815	960
TWO STAGE—							
H.P. per cu. ft. per minute	...	...	.141	.158	.193	.256	.295
Final temp. Fahr. Perfect intercooling	...	...	.85	.83	.81	.77	.75
Adiabatic compression	...	...	224	243	279	352	397
H.P. per cu. ft. per minute	...	...	...	...	.182	.241	.272
THREE STAGE—							
Efficiency compared to Isothermal	...	...	...	...	.85	.82	.82
Final temp. Fahr. Perfect intercooling Adiabatic compression	...	...	...	...	200	241	266

FIG. 9. THEORETICAL HORSE POWER REQUIRED TO COMPRESS ONE CUBIC FOOT OF FREE AIR.

cannot be made on the jarring machine, this three-part job with green sand core is of particular interest. It formerly required a day's labor for molder and helper to make this by hand, not counting the additional labor for a dry sand core. With this pattern, using the wooden stripping plate for withdrawing the pattern from the cheek piece and ramming all three parts on the jarring machine, the complete mold is now made in our foundry with less than two hours' labor.

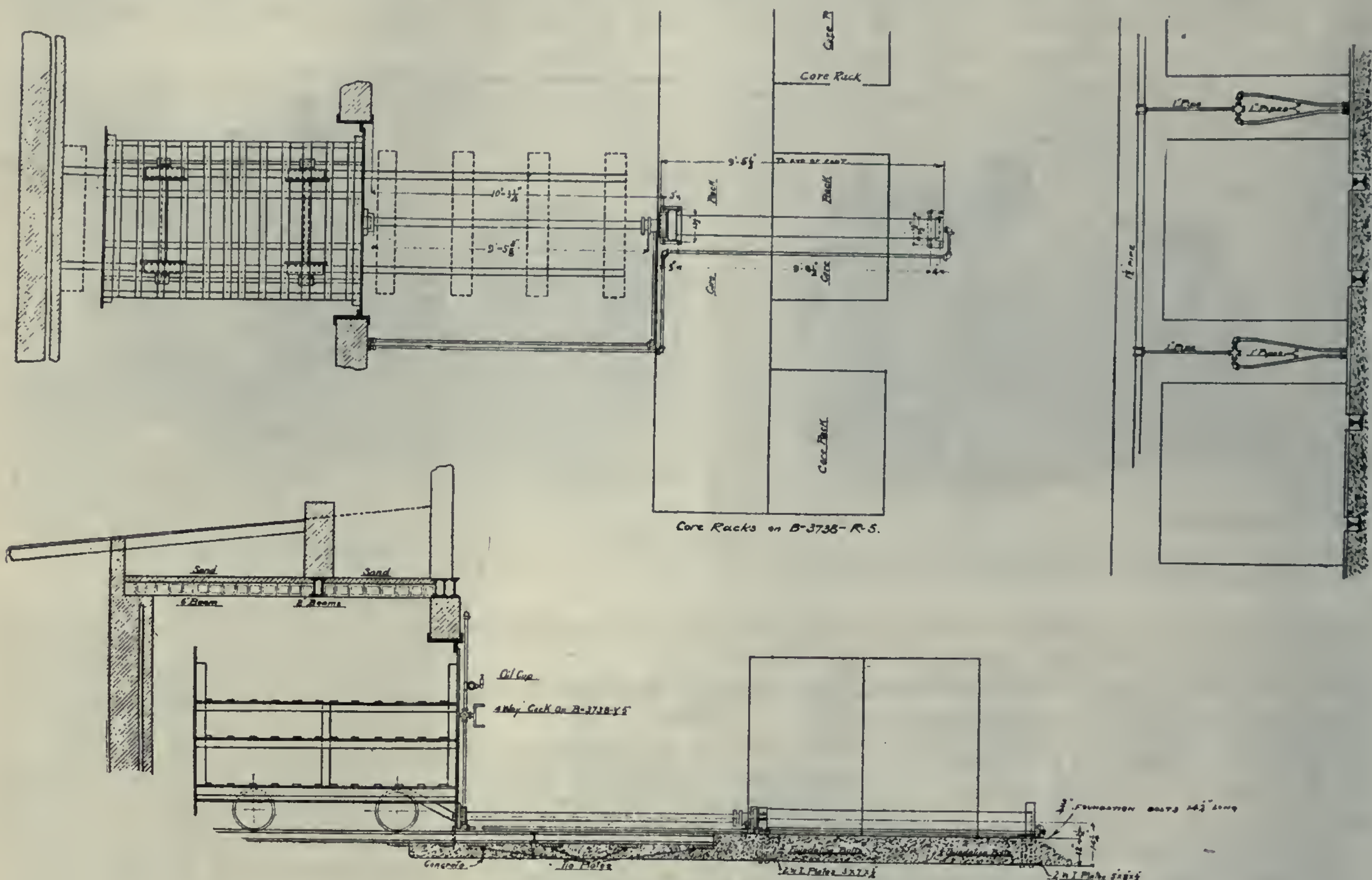


FIG. 10. COMPRESSED AIR CORE CARRIAGE HAULER.

Other Types of Molding Machines.

The jarring machine, though covering a wide range of work, is not a universal panacea for high costs and poor castings. For novelty work, the plain hand squeezer with vibrator attachment is widely used. For this same class of work the ramming is sometimes done by hand or on a plain squeezer, and the pattern drawn by a "sucker," Fig. 15 (background), with vibrator attachment. Fig. 15 shows a split pattern type of power squeezer, which is built by several Companies, and is very successful on small work. The photograph is of a part of the Blake-Knowles Machine Foundry. It is not my purpose to show views of all the molding machines on the market, but merely to point out that there is a wide variety of machines from which to choose, most of them designed for "hooking on to the compressor." The very fact that there are so many types of air operated molding machines only emphasizes the fact that compressed air is to the foundry what steam is to the power plant.

Pneumatic Rammers and Blow Guns.

While speaking of molding machines, I must not forget two very useful auxiliaries—the sand rammer and the blow-gun. Fig. 16 shows a pneumatic rammer finishing off the top of a cope rammed on the jarring machine. It is also a labor saver on ordinary floor work. It also shows a simple form of blow gun for cleaning out dirt from patterns and molds. In the background of the same picture is seen the simplest form of roll-over device for jar-rammed moulds—a spreader frame and flasks with trunnions. This simple device will be found preferable to the elaborate

FIG. 11. PREPARING CORE SAND WITH PNEUMATIC RIDDLES.

roll-over attachments in the jobbing foundry. The special roll-over attachments, however, are very profitable in

Sand Blast Tumbling Barrels.

For cleaning small castings that are not fragile, there is no better method than the sand blast tumbling barrel. These are manufactured in a number of types. There are a number of machines

FIG. 12. JARRING MACHINE SET FLUSH WITH FLOOR. BLAKE & KNOWLES FOUNDRY.

FIG. 14. PATTERN FOR 3 PART MOLDING OF TANK COPE (A), CHEEK (B), STRIPPING PLATE FOR CHEEK (C), DRAG OR NEWEL (D), MADE LIKE A CORE BOX. ALL RAMMED ON JARRING MACHINE.

FIG. 13. MOLD FOR 40 IN. X 21 IN. TWIN CYLINDER OF 18½ X 40 X 21 TWINPLEX BEAM AIR PUMP FOR U.S. BATTLESHIP "NEVADA," SHOWING MOLD BEFORE CLOSING, WITH CORES SET. RAMMED ON JARRING MACHINE, POURED FROM SCHWARTZ MELTING FURNACE. GOVERNMENT BRONZE METAL, 88-10-2. TENSILE STRENGTH 46,000 LBS. ELONGATION, 31%. HEAT 9,000 LBS. CLEAN CASTING, 6,795 LBS.

built on the principle of a rotating barrel, with one or both heads stationary. A nozzle or nozzles from a regular sand blast machine is inserted through openings in these heads, and most of the machines operate on the low pressure system. Some return the sand to the machine by a suction system, and some by gravity, but all operate inside of an outer case closed by a sliding, swinging or rolling door, and connected to an exhaust system.

An efficient sand blast or sand blast tumbler, either of the high or low pressure type, will remove sand and scale, and leave castings better looking than either a plain rumbling machine or the emery brick, wire brush and pickling tank. Castings have been cleaned and their cores cut out in less than an hour

the specialty foundry where they are used for a long time on a single pattern.

We have now made the mold, set the cores and poured the casting, using air hoists and elevators for handling material, pneumatic riddles for preparing sand, oil and air fired ovens to bake the cores, pneumatic core machines to make the cores, and pneumatic molding machines. There now remains but to clean the casting, snag it and ship it, clean up the gangway and temper the sand for the next day's heat.

The subject of sand blasts is so broad that it can only be treated adequately in a separate paper, but the large number of sand blast appliances on the market are sufficient to indicate the extent to which these are applied to the cleaning of castings.

FIG. 15. SPLIT PATTERN SQUEEZERS AND "SUCKER" MOLDING MACHINES (5). BLAKE & KNOWLES FOUNDRY.

each with the sand blast that could not be cleaned by hand in two days. I know of one place where a sand blast tumbling barrel replaced a pickling tank, with the result that shipments could be made at least one day earlier than before. The product required galvanizing, and was

FIG. 16. SPREADER AND ROLL-OVER DEVICE (5), FOR PLAIN JARRING MACHINES, BLOWGUNS (B), CLEANING MOLDS BEFORE CLOSING.

sand-blasted and put in the galvanizing bath the day after it was cast instead of losing a day in the pickling vat.

Chipping Hammers.

The casting now being clean, the fins, etc., are chipped off with a pneumatic chipping hammer. One man chipping with a chipping hammer is as good as two or three with hand chisel and sledge, and the work looks better and smoother. A skilled chipper will quickly remove fins or bunches, so that they appear scarcely to have existed.

Care of Pneumatic Tools.

Before attaching a tool, blow out the air line and squirt oil into the valve. Do not use an air hammer all day long without oiling it. If the hammer has not been used for some time, squirt a little kerosene or benzine into it, connect up the hose, operate the machine for a few strokes, then disconnect and squirt a light machine or sewing machine oil into the hammer. Several of the large oil refiners now supply a special pneumatic tool oil which should be used if possible.

New hammers are always furnished with a gauze strainer, and this should be kept in good condition, as rubber particles and rust from hose and pipes are liable to clog valve passages if allowed to get into hammers. It is a good plan to suspend the hammers over night in a bath of kerosene to clean them out and to prevent rusting from moisture in the air. They must then surely be lubricated before using, as the kerosene leaves them dry.

There are a number of makes of automatic oilers on the market to be attached to the air line a few feet from the hammer. If none of these are used, the hammer should be oiled several times a day. Chisels should be kept in shape, and, in general, the hammer should be treated as if it were a piece of machinery rather than a piece of scrap iron.

Sand Riddles.

We now have only to cut the sand for the next day's work to bring us back to our starting point. Fig. 17 shows a large-sized pneumatic sand riddle cutting sand for the main floor or cleaning up the gangway. This machine will handle all the sand that four or five laborers can shovel into it, and makes quick work of this job. Fig. 18 shows a smaller machine of the round riddle type, located between two split pattern machines in a machine foundry. The sand for these two floors is cut by the molders themselves.

In discussing compressed air in the foundry, one could easily digress in many directions, for compressed air is so thoroughly applied in the up-to-date foundry that a discussion of its use is a discussion of modern foundry practice. It has been my intention simply to set you thinking of places where compressed air would save money in your foundry, and to discussing the statements made, whether you agree with them or not. If I have done this, the purpose of this paper will have been accomplished.

FIG. 17. PNEUMATIC SAND RIDDLE, RECTANGULAR TYPE.

FATAL BOILER EXPLOSION.

TWO dead and three injured is the result of a boiler explosion which took place at the sawmill of Mr. Manley Chew shortly before eight o'clock on the morning of October 21. The mill had been running about three-quarters of an hour when the accident occurred.

The engineer was in the engine-room at the time, and escaped injury, as also did the fireman, who was in the fuel-house. Harry Sager, one of the killed, was assisting to fire the boiler, and is believed to have been blown through the brick wall, as he was picked up outside of the heap of debris. He was injured in a terrible manner. He was fifty-six years of age, and leaves a wife and family of two sons and five daughters. The other victim was a boy named Freddie Fraser, about eighteen years of age. He was standing at the boiler-room door, and was completely buried in the brick and other material. John Dwindle was the most seriously injured of the three who escaped with their lives. It was thought he could not recover, but the physician has good hopes of pulling him through.

The boiler-room was a building about 130 by 40 feet, built of brick, none of which is left standing. The boilers were four in number, and apparently the middle one of the three, the largest, was the one to cause the trouble. The boilers with a capacity of about 150 horse-power were thrown about 25 feet and piled one on top of the other. Brick and pieces of the roof were thrown hundreds of feet. The lath mill and picket mill, which are attached to the main mill, were badly wrecked.

Drill Jig and Fixture Design and Construction

By H. R.

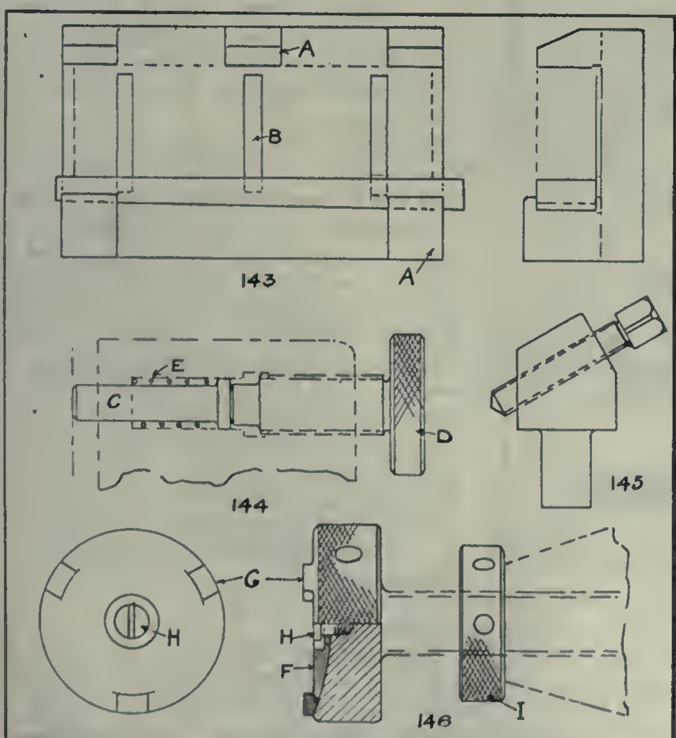
The sketches and data will, the writer hopes, appeal to machine shop superintendents, designers, toolmakers, and novices, as indicating the large place jigs of every kind and for every service occupy to-day in machine shop practice.

IN the design of jigs for small components, it is well to consider if more than one piece can be drilled at one time. By making the locating pins longer, and if there is a locating wall, this can be made higher, and the legs of the jig can be made longer.

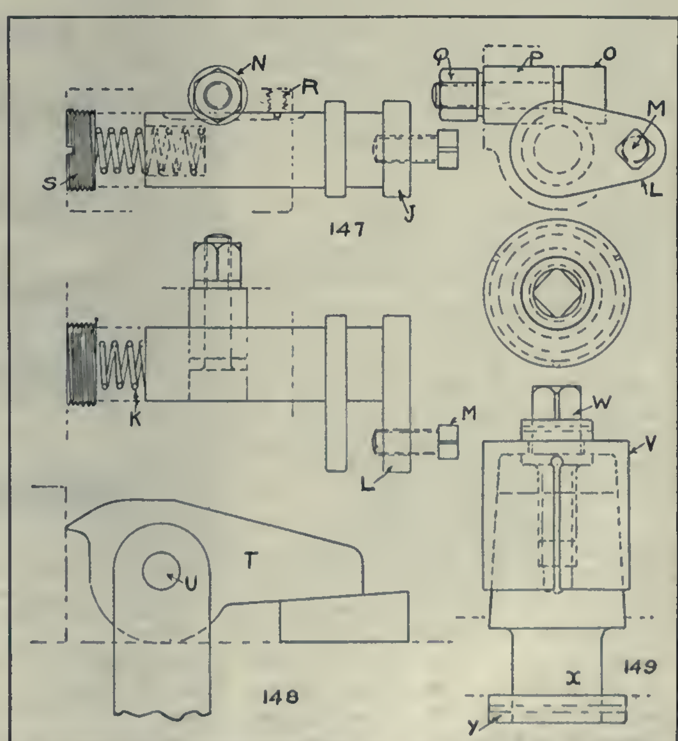
There are other ways of setting up two or more components in one jig to advantage, such as placing them side by side, and perhaps one strap with the adoption of a number of screws will be sufficient for drilling more than one piece.

Sometimes work can be located in a jig to advantage by a wedge knocked into place. An idea is illustrated by Fig. 143 in which two lugs are cast and machined to suit the wedge. These take the full thrust with the top lugs (A). In jigs of this sort a large amount of machining may be saved by simply having strips for machining purposes, as shown at (B). Fig. 144 shows a good way of screwing on to a piece that it is otherwise impossible to get close to for the purpose of clamping. The arrangement consists of a round piece (C), out of which is formed a shoulder. The screw (D) operates against the piece (C), and it will be readily seen that the coiled spring (E) always holds the piece (C) against the end of the screw, either when same is screwed forward or reversed. Many ways of clamping work have been shown which can be adopted for drill jigs as well as other jigs and fixtures. The pointed screw, as shown in Fig. 145, is a good method of clamping work on planing machines, milling machines, etc. The screw set at an angle, as shown in Fig. 145, not only presses the work on the table of the machine, but pushes it up to the other stop.

Fig. 146 shows a clamping method for the backing up of irregular work. This irregularity is taken care of by the spherical piece (F), which, when the screw is adjusted, the end being spherical, finds a level bearing. This is made with three pieces or projections (G), and is held by the screw (H). After this is adjusted to its correct position on the work, it is locked by the nut (I). A very uncommon method of clamping work is shown in Fig 147. In some pieces, it is almost impossible to find a suitable way of holding. Although an expensive arrangement, the one shown should find favor among designers of jigs. It consists of a formed piece (J), which is turned to suit a hole to accommodate it, and is bored for the coiled spring (K), the work being held between the two lugs (L) by the set screw (M). This arrangement is especially adapted for supporting the long end of a lever, so that the other end to that which is held between the lugs (L) is the main clamping portion, and the arrangement shown in Fig. 147 automatically adjusts itself by means of the spring (K). When the work is adjusted, the piece (J) is locked up by means of the wedge arrangement (N). This consists of a bolt (O) and a collar (P). By tightening the nut (Q) it will be readily seen that the piece (J) is held securely, as the screw (R) prevents the piece (J) from coming out of its bearing by working in a slot, and the compression of the spring can be regulated by the plug (S). Fig 148 shows what is called a gripping dog. The base of the dog is slotted to receive the jaw (T), which fulcrums on a cross pin (U); a wedge is inserted under the end of the tail dog, and by hammering this inward the jaw is caused to grip both inward and downward at the same time. This will firmly hold the casting down on the table of the machine as well as gripping it. Of course, this tail can be drilled and threaded to take an adjusting screw if desired. Fig. 149 depicts a way of clamping down work by an expanding bushing. The hole into which this operates is bored first. The arrangement consists of a split bushing (V), which is saw cut in three places and shouldered on the top portion, so that the vertical movement can be controlled by the operating screw (W). The collar is pegged into place after the



DRILL JIG AND FIXTURE DESIGN AND CONSTRUCTION.



DRILL JIG AND FIXTURE DESIGN AND CONSTRUCTION.

bushing is slipped over the screw. It will be seen that the vertical movement of the bushing is entirely mechanical, no springs being used, as in some cases. By the adjustment of the screw, the bushing is moved downward or vertically at will. It works on the stud (X), which has a taper portion for expanding the bushing as it is screwed down. This is fitted into the necessary fixture, and is held securely in place by the collar (Y), which is pegged on to the stud (X).

PROFIT SHARING AMONG EMPLOYEES.

THE proposal by a New York mercantile house for participation financially by its employes in the operations of the house, and a further step in this direction by the Youngstown Sheet & Tube Co., both announced within the last few days mark the latest adoptions by large companies of this practice which has become so general among industrial corporations in the past decade.

The United States Steel Corporation was a pioneer among the prominent industrials to initiate profit-sharing on a wide scale for its employes. The finance committee of the company selected the method of stock-subscription in 1902, and allowed its 55,000 (at that time) employes to acquire preferred stock at a price somewhat under the current quotations. Beginning with 1909, and in following years, the common stock of the corporation has been very successful.

Seeking Continuous Service.

The International Harvester Co., the Republic Iron & Steel Co., the United States Rubber Co., the National Biscuit Co., and the E. I. du Pont de Nemours Powder Co., are among the big concerns which have put in force plans more or less resembling that of the Steel Corporation.

In several cases, in order to induce employes to continue as shareholders in the company after they have subscribed, extra payments have been made annually if the holders have been continuous employes of the company and have given satisfactory service. For example, in the 1911 offering to United States Steel Corporation employes, when the preferred stock was sold at $114 and the common at $70, it was provided that on exhibiting a certificate that he had "been continuously in the employ of the corporation and had shown a proper interest in its welfare and progress," the stock-holding employes would receive a payment of $5 per annum per share of preferred and $3.50 per share of common. With similar restrictions the International Harvester Co. allowed a special payment of $4 per share of preferred and $3 per share of common.

Pensions and Bonuses.

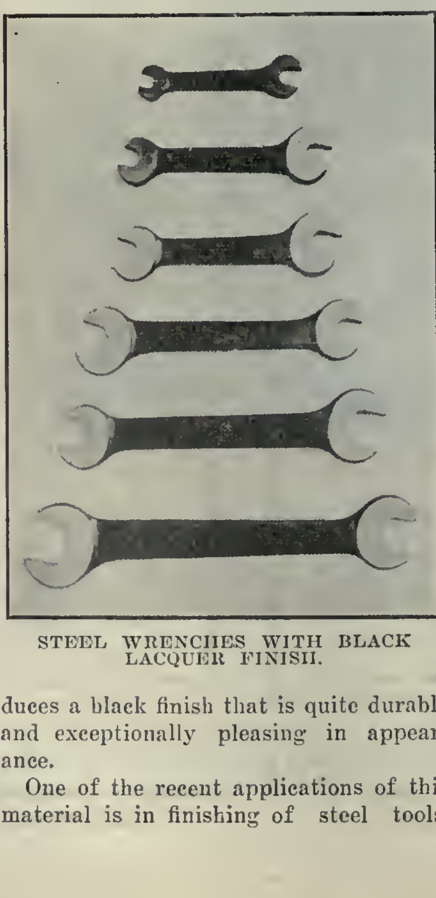
Among the companies which have established comprehensive pension and accident policies, including voluntary and permanent disability reliefs, are the International Harvester Co., Youngstown Sheet & Tube, du Pont de Nemours Powder Co., American Sugar, Consolidated Gas, Philadelphia Rapid Transit, and Brooklyn Union Gas. In many cases bonuses have been given employes, the bonus taking various forms, from an outright lump sum as Eastman Kodak distributed, to a graduated percentage of salary after certain years service as was put in force by Sears-Roebuck.

The distribution of large cash bonuses in lump sums has been found impracticable by the Youngstown Sheet & Tube Co., and other companies whose labor is in large part foreign, as it has been the case in the past that numbers of the employes returned to their native countries on receipt of their share.

Many of the railroad companies have comprehensive pension plans in force, and, in years past, several have attempted stock distribution schemes, but with little success, on account of the comparatively low income yield of the securities.

BLACK LACQUER ON STEEL TOOLS.

BLACK lacquer, says the "Brass World," has come into quite extensive use within the past few years and has proved to be a very serviceable material for many classes of work. It produces a black finish that is quite durable and exceptionally pleasing in appearance.



STEEL WRENCHES WITH BLACK LACQUER FINISH.

One of the recent applications of this material is in finishing of steel tools, such as the wrenches herewith illustrated. Previous to the use of this black lacquer, it was customary to leave the wrenches with a case-hardened surface or an oil black surface, both of which are more expensive to produce than the one obtained by the use of black lacquer. To be sure, the oil or case-hardened finishes are still used. The lacquer may be applied to the article after the forging has been made and the necessary machine work has been done upon it. The brush is the best method of applying the lacquer.

Tools finished in this manner have a very attractive appearance, and the lacquer is quite durable, as, after they have been put into use oil has no effect upon it.

FLAME TEMPERATURE IN LOCOMOTIVE FIRE-BOX.

INASMUCH as the efficiency of a locomotive increases as the degree of superheat rises, states the Railway Gazette, it can readily be seen that the flame temperature in the fire-box is a very important factor, and it is quite necessary that the draught appliances be so constructed as to produce an even, steady pull over the entire grate, and a draught condition that will make the engine steam freely. In order to obtain this it is usually necessary to employ a somewhat smaller nozzle, blast pipe, and chimney arrangement. On account of the smaller volume of exhaust steam and its higher velocity a moderate reduction in the size of the exhaust nozzle does not produce the same bad effect as with saturated steam, and its reduction to produce the desired draught conditions may be reached before there is any notice of the effect in the way of back pressure.

However, the necessity for these changes depends much on the quality of fuel and the operating conditions. It is indispensable that the firing should be light and regular, and a high flame temperature maintained, whilst banked fires and the application of fuel in large quantities should be avoided, as this practice produces a low flame temperature which materially reduces the degree of superheat, and affects the economy and efficiency of the locomotive. Experience has shown that a very bad condition of affairs can exist in the front end of a superheater locomotive, and still the performance be reasonably satisfactory.

Commissioner Harris, Toronto's city engineer, will start a technical library of 900 volumes for the benefit of the mechanics and employes of the Works Department.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

MACHINING C. I. BALL RINGS.

By. Geo. Black.

THERE are a number of ways of producing cast iron ball rings, the method employed depending upon the diameter of the ring, whether it is to be finished all over, whether it is to have a radius at both ends or at one end only, and whether both ends require a ground joint. The methods and fixtures herewith described are particularly adapted to that type of ball ring which requires to be finished all over, with a ground joint at each end, as shown in Fig. 1. These rings are machined from a cylindrical casting, Fig. 2, from each of which six rings are obtained, leaving about 5/8 inch of the casting to be scrapped.

First Operation.

The first operation is to face, bore and thread the casting where marked "f." The turret lathe which handles this work in the shop with which the writer is connected is shown in Fig. 3. The casting is held in a four-jaw chuck, but a two-jaw box chuck gives even better results. The cross slide carries the facing tool and works outwards from the centre, while the turret is boring the hole ready for tapping. The turret is then re-set and the hole tapped. The detail operations and times are:—

	Rev. per Min.	Feet per Min.	Depth of Cut.	Feed per Rev.	Time, Minutes.
Face	32	50	3-32 inch	.02 inch	3.0
Chuck and true up					1.5
Set cross slide tool and cut					0.5
Set turret tool and cut	These operations are performed while casting is being faced off.				
Bore for threading (two cuts)					
Re-set turret tool					
Tap hole	12	18		Hand	2.0
Re-set cross slide, and change speed					0.5
Re-set tool. Remove work					1.0
Total time in minutes					8.5

The casting next passes to a LeBlond 21-inch heavy duty turret lathe which has been specially tooled up for this work and gives excellent results. Fig. 4 illustrates the method of chucking the casting for this operation. It is very economical, as it enables the whole of the casting to be cut up into rings except the last 5/8 inch. The half tone also shows the tools used in this operation. The combined turning and boring tool-holder is seen at (A), it having been removed from the turret in order to show it more clearly.

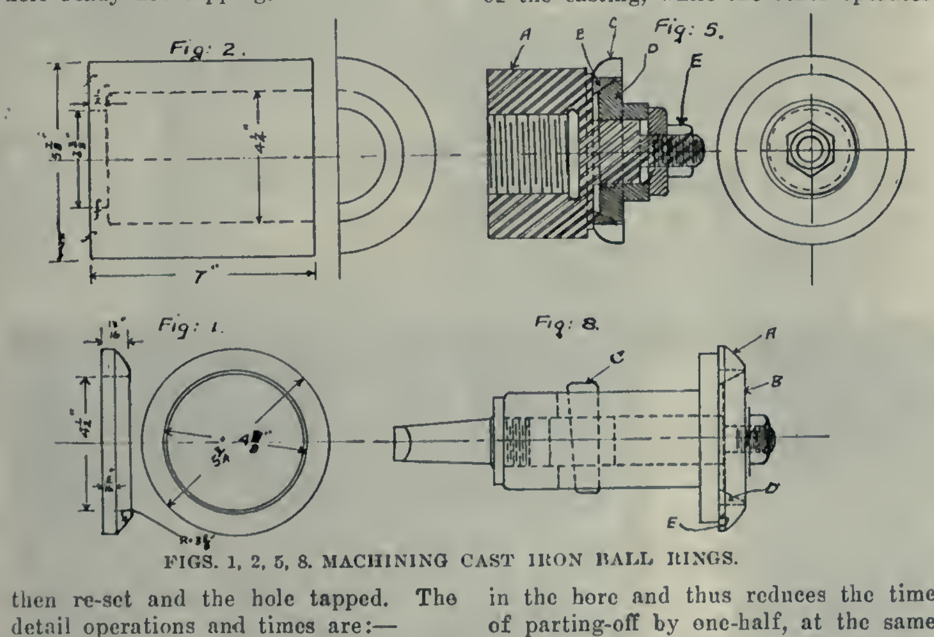
At (B) is seen the tool-holder which carries the two parting-off tools (b,b), one of which operates from the outside of the casting, while the other operates in the bore and thus reduces the time of parting-off by one-half, at the same time distributing the work over two tools, and thereby prolonging the time between grindings.

The ball or radius, is formed by two sweeping tools, one of which is seen at (C). This tool roughs out the radius, while the other not seen in the turret, is reserved for a light finishing cut. The detail operations for this stage of the work are:—

	Rev. per Min.	Ft. per Min.	Depth of Cut.	Feed per Rev.	Time, Minutes.
(1) Screwing casting on adapter	..	..	......	....	0.75
(2) Re-set tool and cut	..	..	......	....	0.5
(3) Rough turn and bore	32	52	1/8 in.	.031	7.00
(4) Re-set tool and cut	..	..	......	....	0.5
(5) Rough face end	32	52	1/8 in.	.031	0.5
(6) Re-set tool and cut. Change speed......	..	..	......	....	0.5
(7) Rough ball	20	33	1-16 in.	Hand	1.5
(8) Re-set tool	..	..	......	....	0.25
(9) Finish ball	20	33	1-32 in.	Hand	1.25
(10) Re-set tool and cut	..	..	......	....	2.5
(11) Part-off ring	20	33	1-16 in.	Hand (.007)	2.0
(12) Repeat items No. 6 to 11, inclusive, for five other rings	..	..	......	....	30.0
(13) Remove scrap casting	..	..	......	....	0.5
Total minutes for six rings					47.75
Total minutes for one ring					7.95

Flat Sides Finish Turned.

The ring is now ready to have the flat sides finish turned, and, for that purpose, passes to an engine lathe fitted with a device for holding it securely without distortion. The arrangement, which is shown in Fig. 5, materially reduces the time of chucking. The body of the adapter is seen at (A), (B) is the split ring, (C) the ball ring in position, and (D) the expanding cone. Tightening up the nut (E) expands the split ring into the ball ring, holding it firmly, yet without undue stress.



FIGS. 1, 2, 5, 8. MACHINING CAST IRON BALL RINGS.

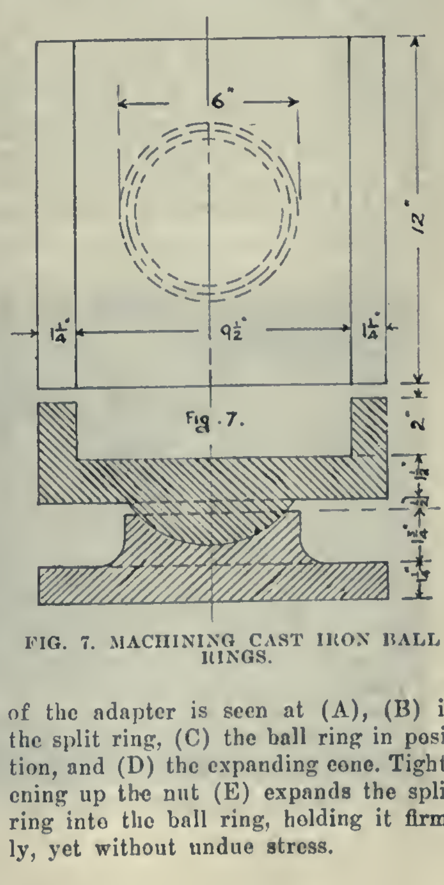


FIG. 7. MACHINING CAST IRON BALL RINGS.

The detail operations on this work are:—

	Rev. per M.	Ft. per Min.	Depth of Cut.	Feed per Rev.	Time, Minutes.
Chuck					.25
Face	45	65	1-32 in.	.007 in.	2.25
Remove					.25
Total time in minutes					2.75

These attachments make a splendid combination for turning out accurately

The average time in minutes for this part of the work is:—

Chuck ball ring seat	.25
Grind ring to seat	3.00
Clean and remove	0.50
Total time in minutes	3.75

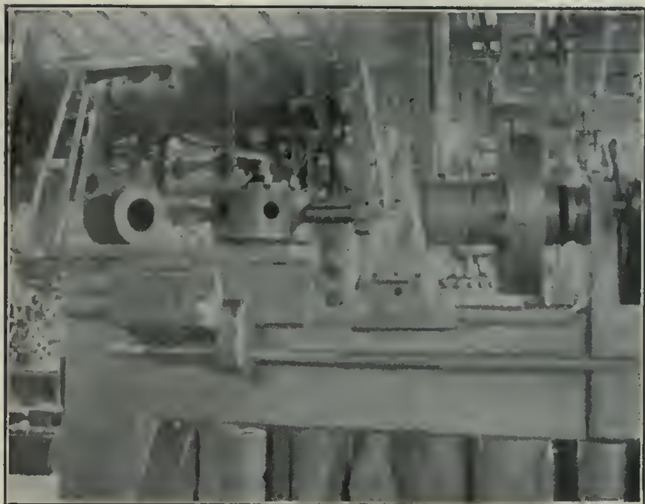


FIG. 3. MACHINING CAST IRON BALL RINGS.

FIG. 4. MACHINING CAST IRON BALL RINGS.

Grinding Ball Ring Into Seat.

The next operation is that of grinding the ball ring into its seat, which in this case is the gland seen at (A) in Fig. 6. The work is handled on an old drill press which adjoins the lathe used for the previous operation. The device shown in Fig. 7 is used for grinding in the ball joint. It may also be seen at (A) and "B" in Fig. 6. Its utility is obvious, ensuring, as it does a perfectly spherical ball joint free from grooves. The ball ring is held and driven by a device similar to that used for the finish turning of the flat side of the ring. It is shown on Fig. 8, from which it will be noticed that in this case the expanding cone (B) is drawn into the split ring (D) by the taper cotter (C), the ball ring (A) truing itself up against the shoulder (E).

ground ball rings, the average time taken in minutes being:—

Chuck ring and place gland	.5
Grind ring to gland	5.0
Clean, remove ring and gland	.5
Total time in minutes	6.0

Grinding Flat Side of Ring to Seat.

There now remains the flat side of the ring to be ground to its seat, and Fig. 9 illustrates how an old lathe head-stock was rigged up to take care of this work. The piece upon which the ball ring seats is seen in the chuck, while the ring is held upon a wooden taper plug furnished with a cross handle. This may be seen in Fig. 9 at (A). The handle enables the operator to apply the pressure evenly, and control the ring during the grinding operation.

Summary of Operations.

The above arrangement is handy, turns out good work and has the additional advantage of being rigged up cheaply. A summary of the foregoing operations will show that the total machine time upon the ball ring shown in Fig. 1 amounts to:—

1st operation, face and thread	8.5
2nd operation, turn, bore, ball and part off	7.95
3rd operation, finish face flat side	2.75
4th operation, grind ball joint to seat..	6.00
5th operation, grind flat side to seat	3.75
Total time in minutes	29.00

J. F. Gaffney, who has been connected with Drummond McCall & Co., Ltd., of Montreal, as head of the pig iron sales department in Ontario, has resigned to accept a similar position with R. J. Mercer & Co., Montreal and Toronto.

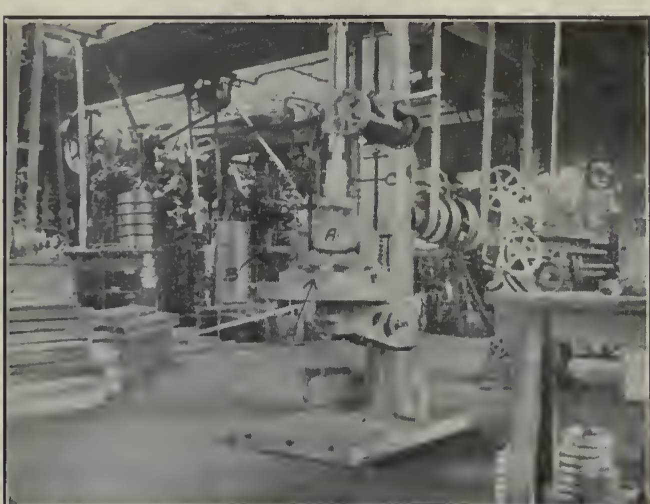


FIG. 6. MACHINING CAST IRON BALL RINGS.

FIG. 9. MACHINING CAST IRON BALL RINGS.

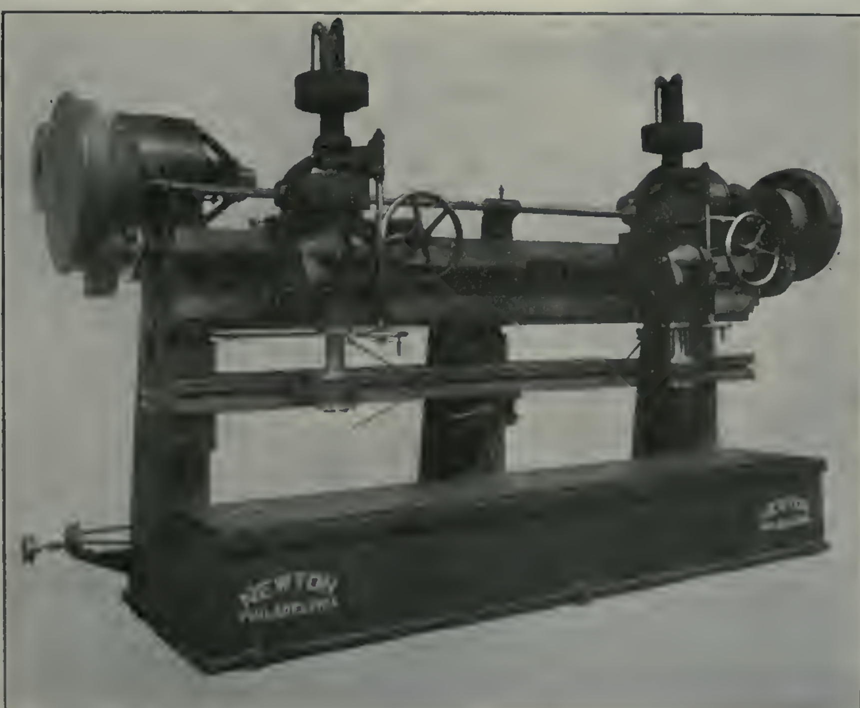
DEVELOPMENTS IN MACHINERY

A Record of New and Improved Machinery Tending Towards Higher Quality and Economical Production in the Machine Shop, Blacksmith Shop or Planing Mill.

DUPLEX LOCOMOTIVE ROD BORING MACHINE.

OUR illustration shows a modernized design of the Duplex Locomotive Rod Boring Machine built by the Newton Machine Tool Works, Philadelphia, Pa., in which particular pains have been taken to protect fully all exposed gears for the safety of operators, and to make the equipment adaptable to a large line of work not heretofore covered, including the boring of boxes, brasses, etc., and the turning of oil cups from the solid. Motion for the drive from the two 10 H.P. General Electric, RLC-116, 400 to 1200 R.P.M. motors, direct, gives spindle speeds from 12 to 36 R.P.M., and through back gears, gives spindle speeds from 40 to 120 R.P.M.

Each motor is operated independently with push button control. The guide bearing rail and the guide bearings which are adjustable in vertical and horizontal directions respectively, securely support the ends of the spindle. The spindle has hand slow and hand fast, vertical adjustment, three changes of gear feed, horizontal adjustment on the rail by hand, and provision for securely locking the saddle in any desired position. Lubrication is by gravity from the storage tank inside the cross rail, while provision is made for draining to additional storage tanks in the table, and the lubricant is transferred from table to rail by gear pump. This machine is capable of boring the largest rods with centre distances between bores of 30 in. to 11 ft.



DUPLEX LOCOMOTIVE ROD BORING MACHINE.

SYNCHRONOUS FREQUENCY CHANGER SETS.

MANY operating conditions require the conversion of electrical energy from one frequency to another, and an economical and efficient means of accomplishing this is by means of frequency changers. Some of the special features of these Westinghouse Electric sets are that their design embodies space economy. They are self-starting, and the stators of both motor and generator are mounted on a common bedplate, being as close together as mechanical clearance and ventilation requirements will permit. The rotating parts of both machines are mounted on a common shaft. A pedestal bearing is ordinarily mounted on a "bridge," as illustrated in Fig. 3, and in case of repairs, this bridge can be quickly removed and the stator easily slid to one side along the bedplate, to allow ready access to either stator or rotor.

If conditions require two or more synchronous sets to operate in parallel, the rotors of all generators must bear the same phase relationship on their respective shafts. It is not practical to set these rotors with sufficient accuracy during the process of manufacture. One stator is, therefore, set in a "cradle," which permits of sufficient rotation to obtain a proper alignment, as illustrated in Fig. 2. This adjustment has to be made only when starting up the sets for the first time, and thereafter their relative locations do not change.

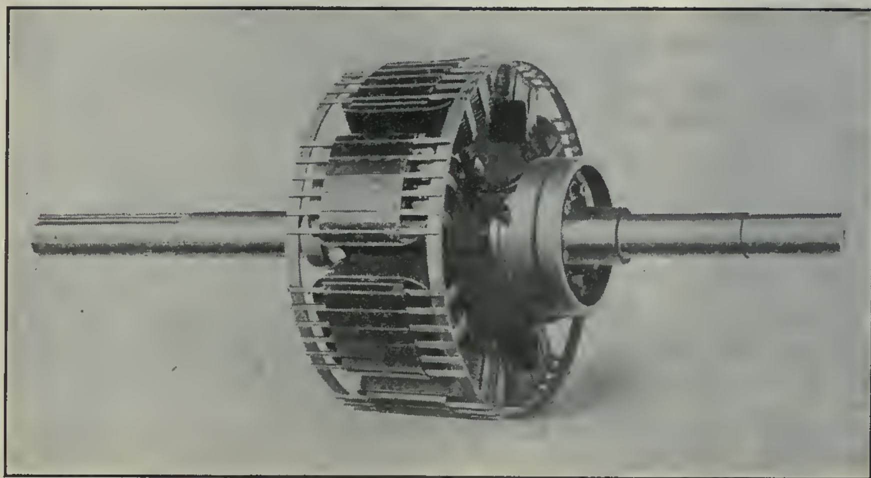
The stationary frames are made of strong, rigid iron castings, into which soft steel laminations are dovetailed and securely fastened. Ventilating ducts are spaced at frequent intervals across the face of the armature punchings. The armature coils are vacuum dried and impregnated before the outside insulation, consisting of wrappings of mica and paper on the straight portions of the coils which lie in the slots, and servings of treated cloth over the V-shaped coil ends is applied.

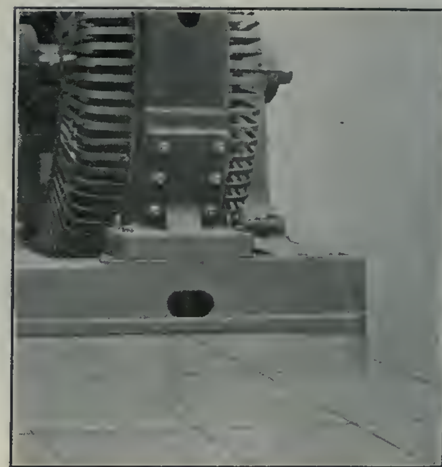
A rugged spider is used, to which field poles, built of thin steel laminations riveted together, are either bolted or dovetailed, as required by the speed of set. These poles have overhung tips provided to support the field poles, which are built up of heavy copper strap wound on edge, and insulated in such a manner that the individual turns are each exposed to the air for ventilation. The bearings of these standard frequency changers are self-oiling and built of cast iron shells of ample size, split horizontally to allow ready removal, and lined with grooved babbitt. They are fitted with oil rings, which carry the oil from a well in the bottom of the shell to the shaft. The shaft is provided with oil-throwers and catchers. Covered openings in the upper shell facilitate inspection of the oil rings.

The selection of a set to be used for each installation is worthy of careful consideration. A high-speed set is generally somewhat cheaper than a low-speed one, but may not give the exact frequency ratio required. The synchronous type has certain advantages which render it the almost invariable choice, but there may be cases where an induction set would be preferable. The synchronous set is slightly more efficient. It permits of operation of the motor at unity power factor, its point of highest efficiency, or by slightly increasing the capacity, at a leading power factor, and thus obtaining a corrective effect which is often desirable. The synchronous set can at slightly increased expense be made reversible.

The synchronous set is at a disadvantage when of relatively small capacity and required to tie two much larger generating systems together. In this case, the speed of one system must always have the same relation to the speed of the other system, and any change on one must be transmitted through the set, and the frequency changer supply the power necessary to bring the speed of the other system to its corresponding value—enabling heavy overloads to be imposed on the set. Here the induction outfit, with some variation in slip possible, may be the proper machine.

A direct-connected exciter can be supplied, mounted on either motor or generator end of the set, and of capacity to furnish either motor or generator, or both, with the necessary excitation. When variable loads are likely to be encountered, and an automatic regulator is used, separate exciters for motors and generator are usually preferable, inasmuch as a common exciter would necessitate constant attention in order to control the power factor of the motor. All sets are carefully inspected during each step in the process of manufacture and before each succeeding operation is started. When completed they are tested under conditions as nearly identical as possible to those which future service will demand.


SYNCHRONOUS FREQUENCY CHANGER SET DETAIL.


SYNCHRONOUS FREQUENCY CHANGER SET DETAIL.

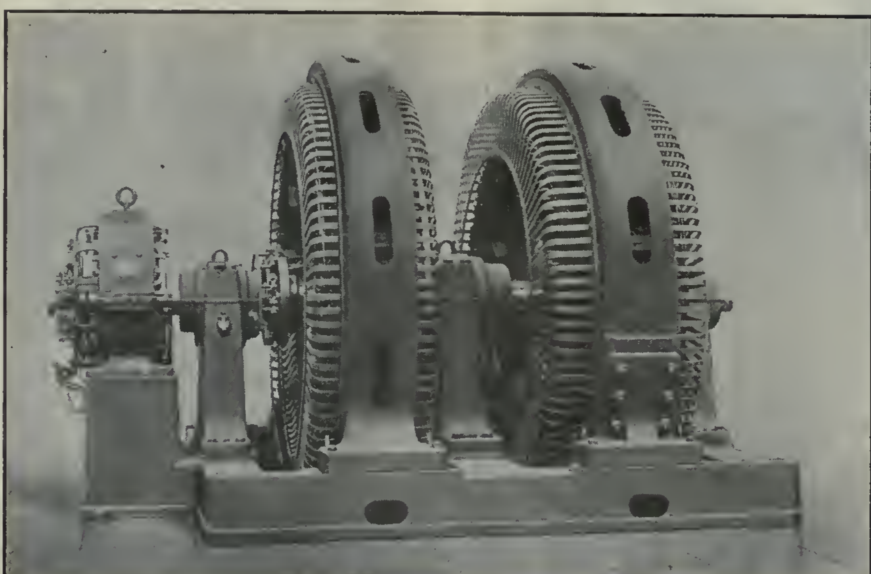
THE ROBB CORLISS ENGINE.

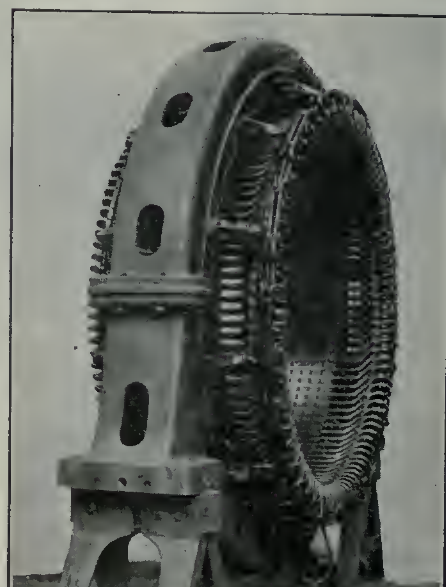
THOSE who have wanted to profit from the economy of a Corliss engine but have hesitated to install this type because its speed is too low, especially for driving a generator direct-connected, may be interested in the Robb Corliss engine. With shorter stroke, much higher speed, positive operation of valves, and complete enclosure of moving parts this type overcomes many objections to the old forms of the well-known Corliss engine, yet at no sacrifice to the usual advantages of this valve gear—almost perfect steam distribution, independent adjustment of the events of the stroke, small clearance, and separate cylinder ports for admission and exhaust which reduce cylinder condensation.

Speed.

Successful operation at speeds from 90 to 225 revolutions per minute is claimed to be the principal advantage resulting from the modified Corliss valve gear as used in the Robb engine. This high speed is made possible by simplifying the valve gear so as to eliminate all springs, dash pots, latches, cams, and disengaging parts.

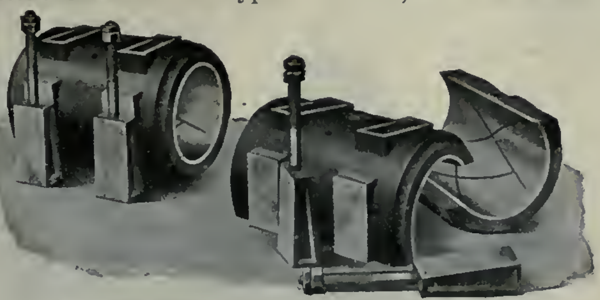
In addition to the higher speed, the absence of these delicate parts means a smooth running engine, and so little wear on the valve gear that steam economy and good regulation are maintained indefinitely. The economy does not fall off rapidly after a short period of operation because the valve is not under the strain caused by the continual lifting of dash pots; and the valves cover the ports so


SYNCHRONOUS FREQUENCY CHANGER SET.


SYNCHRONOUS FREQUENCY CHANGER SET DETAIL.

firmly and seal them so tightly that there is no chance for leakage.

In other respects the Robb Corliss type



MAIN BEARINGS, ROBB CORLISS ENGINE.

is designed on the lines of modern heavy-duty Corliss engines.

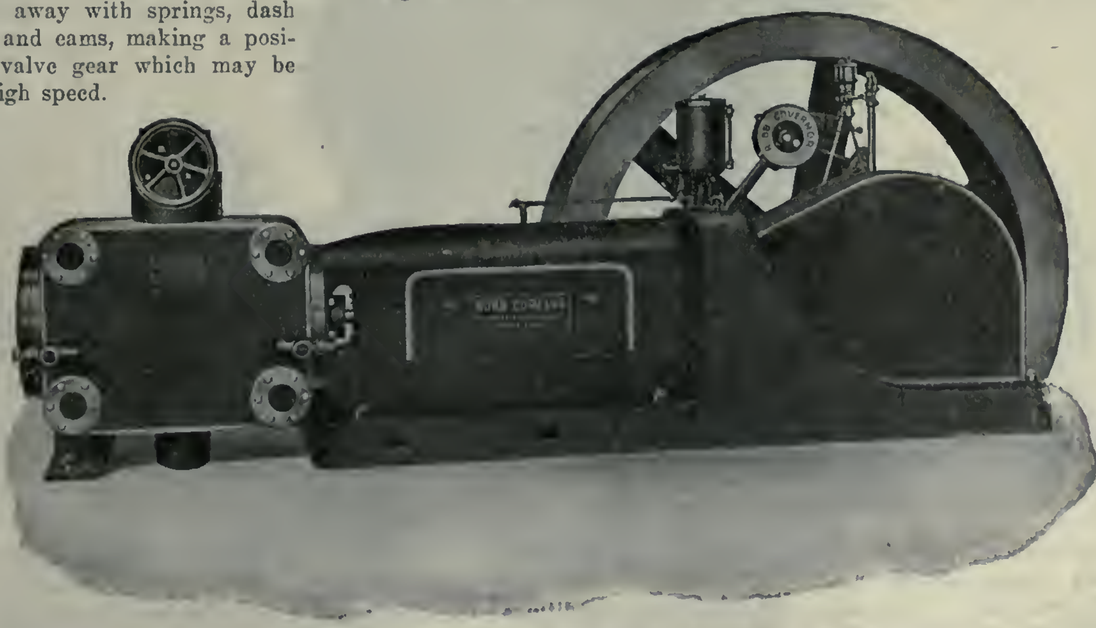
Valves.

Full pressure of steam gets quickly into the cylinder of the Robb engine because of the triple port opening through the admission valves; and there is free exit through the exhaust valves at the proper time because of the double port opening. The steam pressure is well taken care of by the large surfaces of the valves which are nearly balanced by carrying the metal around the top, resulting in long life and minimum wear of valves and seats.

Accurate machining of the ports is possible because the valve seats are separate bushes, machined before being put in place.

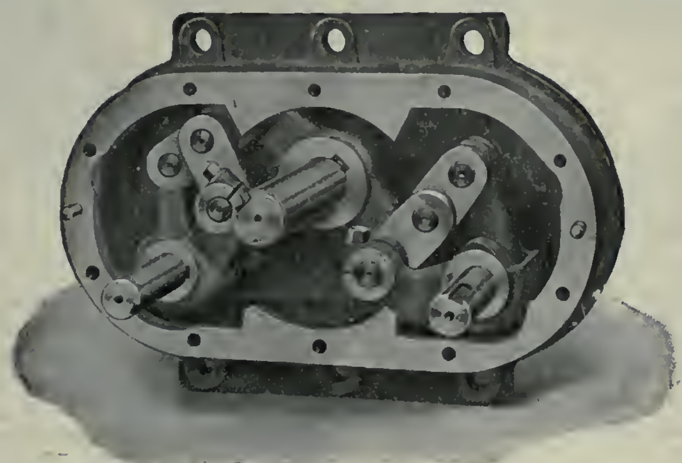
Valve Gear.

A valve action that does not depend upon a releasing gear for quick opening and closing is a distinct feature of the Robb Corliss engine, yet the motion imparted to the valves is identical with that of drop-cut-off gears which pick up the lifting arms, and then drop them. Two small links between the wrist plate and bell crank do away with springs, dash pots, latches, and cams, making a positively-driven valve gear which may be operated at high speed.



SINGLE CYLINDER, ROBB CORLISS ENGINE.

The valve gear is positive. It does not let go of the valves, but with positive action opens them quickly, closes them promptly, and holds them stationary during the closed period, which is over half the time, and constitutes that period when the unbalanced pressure between the steam pipe and the cylinder would cause friction. Elimination of many working parts, all latches and detach-



VALVE GEAR CASING, WITH COVER REMOVED.

able pieces gives a smoother running gear, with fewer surfaces subject to wear, and a gear quite noiseless, even at high speed.

The greater possibilities of high-speed Corliss engines, especially the driving of generators direct-connected, call for the use of a positive valve gear which fulfills every requirement for this class of difficult work, while enclosing the valve gear in a tight casing, so that all working parts are in a bath of oil, reduces to a minimum the friction and wear detrimental to releasing gears.

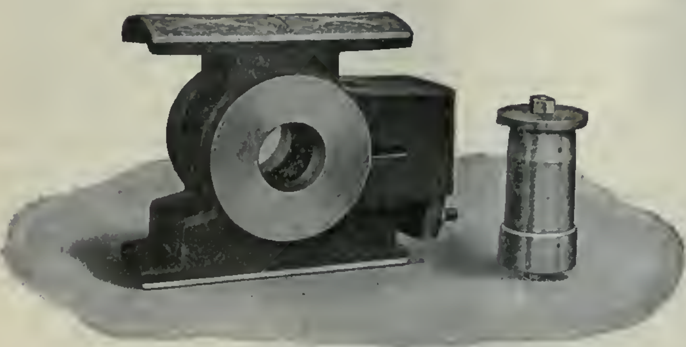
Eccentrics.

A more desirable and economical steam distribution is possible with the double eccentric arrangement as it permits of an independent setting of exhaust valves for release and compression. Two eccentrics are used in the Robb Corliss engine, one forming a part of the governor and controlling the steam valves, and the other operating the exhaust valves through a wrist plate in the usual way.

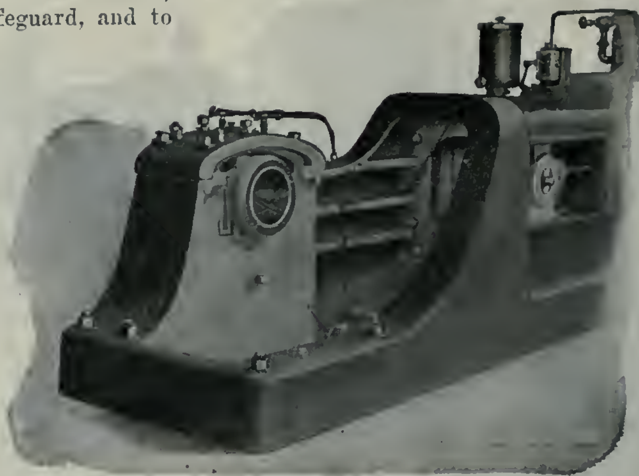
Cut off is controlled by the Robb Governor which is a modification of the Sweet shaft governor. It is located in the fly-wheel of the engine, and drives the valve gear and controls its operation. It gives positive quick action, with closer regulation than the indirect method of governing.

Simplicity and power are combined by

reducing the number of main parts to three, and carrying the centrifugal weight upon a spring entirely independent of any bearings. The heavy strain caused by centrifugal force is not brought on the suspension pin because it merely carries the eccentric and drives the valve gear. Under these conditions, it is easily lubricated for long periods. In all positions the governor is in gravity balance, because the eccentric balances the centrifugal weight. Disturbance by the reciprocating motion of the valve gear is prevented by the inertia of the weight, and quick regulation is obtained by placing the weight so that it gets sufficient effect from inertia.



CROSSHEAD, ROBB CORLISS ENGINE.

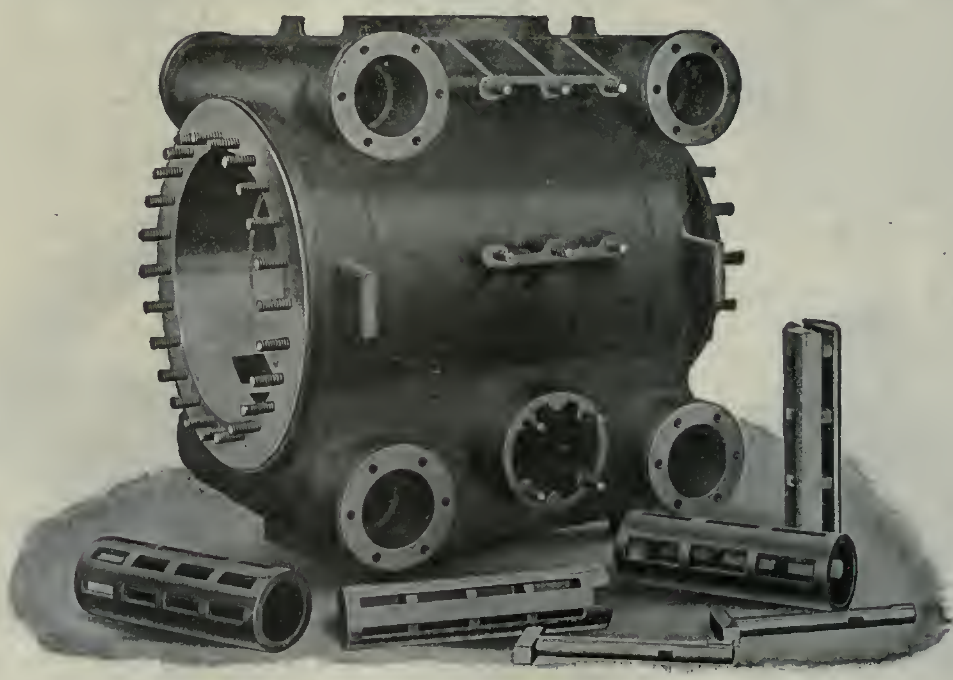


CRANK END OF BED SHOWING OIL PIPING, ROBB CORLISS ENGINE.

Lubrication.

In common with most up-to-date engines, the moving parts of the Robb Corliss engine are completely enclosed, affording ample protection for the moving parts and cleanliness of both engine and engine room. The bed castings are so arranged that the oil is retained and carried to the crank pit, and from this point it is distributed to all the bearings of the engine by means of an oil pump driven from the crank pin.

Positive lubrication is thus assured, but as an additional safeguard, and to provide for any emergency, an oil reservoir is mounted on top of the engine ready for immediate use in case anything should go wrong with the oil pump. In this way, the system of lubrication is practically duplicated. The pressure is kept constant by the relief valve in the oil piping. Cylinder lubrication is provided by a sight feed lubricator, and by a positively-operated power pump of approved design with oil pipes leading to the cylinder at the proper points.



CYLINDER, VALVE AND BUSHES OF ROBB CORLISS ENGINE.

Balance.

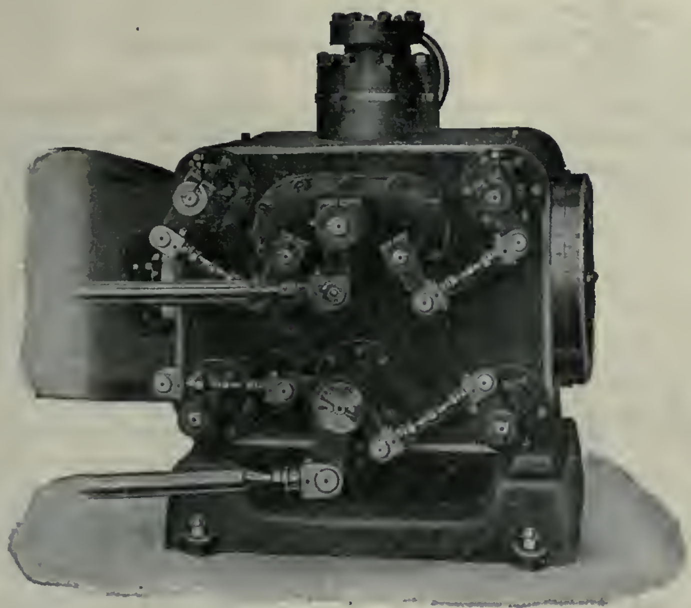
The reciprocating parts are balanced for running conditions by properly counterweighting the cranks and setting the valves to give correct compression to cushion the reciprocating parts at the ends of the stroke.

General.

To obtain that much desired combination in engine building, constant operation day after day without attention, minimum upkeep, and economy in both steam and oil,—builders must use heavier designs and provide for higher speeds and greater pressures. Saving of floor space also is a feature that must not be lost sight of when all-round efficiency is desired; nor can cleanliness of engine room be neglected when designing an engine for the up-to-date power plant.

It has been customary to consider the Corliss type of engine efficient as regards low steam consumption, but it is as freely admitted that the usual forms do not have the compactness that comes from short stroke and high speed, nor are they often enclosed. The relatively long stroke and low speed of the older Corliss engines require a large floor area by themselves, and the amount of room taken up is still greater when they drive electric generators by belts.

If the generator armature is placed on the engine shaft in order to save some



VALVE GEAR, ROBB CORLISS ENGINE.

floor area, its speed is necessarily so low that the generator is very large and therefore expensive.

THE PASSING OF THE PIGEON-HOLE.

LUTHER M. GULICK, M.D., in The Ford Times, tells how he found that one of the leading publishing concerns had dispensed with roll-top desks and equipped their entire establishment, from stenographer to head of department, with flat-top desks. He says that, in answer to his inquiry, he was informed that it expedites business.

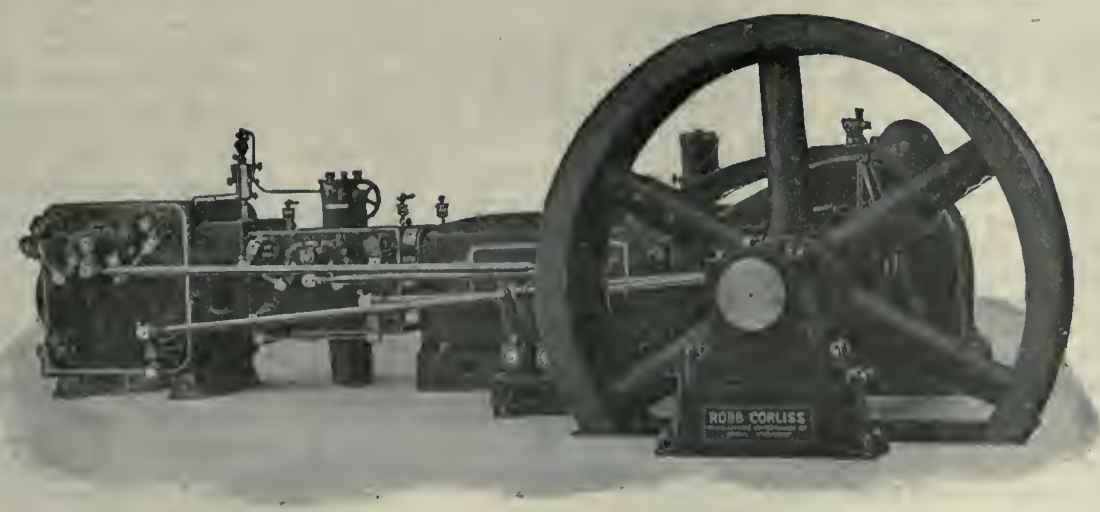
"Take the case of a claim that must be passed along from one hand to another until it has been corrected and O.K.'d five different times. Now, if that claim can get stuck in a pigeon-hole anywhere—a thing that used to happen right along—it's likely to be forgotten. The result is, delays and confusion and ragged business generally, but if there are no pigeon-holes and it has to lie in plain view on top of the desk, it can't be forgotten until it is attended to."

"For those who have ears to hear," continues Dr. Gulick, "the flat-top desk has a moral. It stands for a principle which is applicable throughout one's mental life. It stands for definite, clearly-marked stages—stopping points—breaking-off places. Unlike the man with a too big idea, the man with small, everyday ideas keeps his mental balance not primarily because his nervous system is of a more stable character—though that may be true, too—but chiefly because his little ideas work out directly and successfully; he can get them done with and out of the way. His jobs are finishable. He enjoys good mental health.

"Big problems can be split up. They are always reducible to fractions—at least for practical purposes they are—and each fraction can be dealt with separately. We do not need always to keep ourselves staring at the whole, worried by its magnitude and its difficulty and its imperative claims. When a man quits his desk at night with the assurance that everything has been brought to a definite stopping place, and that to-morrow he will know just where he stands with reference to the day's work, he can really rest. It's a very different state of mind from the one that comes when he pulls down the cover over a mussy array of odds and ends, and runs.

"The greater the pressure under which a man works—the greater the actual count of his responsibilities—the more essential it is that he should be able to get away from them. The consciousness of freedom is a thing that stays there in the back of his mind even when he is smashing and driving away at his work; and it's a saving knowledge. It brings confidence, helps him keep his balance.

"The flat-top desk cleared of the day's debris, clean and fresh for to-morrow's new duties, or for its new instalment of old duties, is a symbol worth bearing in mind. The brain of the man who has taken its moral to heart keeps fresh and clear, because it earns its night's repose. Most big victories, when looked at closely, turn out to be only piled up results of many small victories, such as are always achievable in the well-directed manoeuvres of each separate day."



TANDEM COMPOUND, ROBB CORLISS ENGINE, TYPE "F."

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

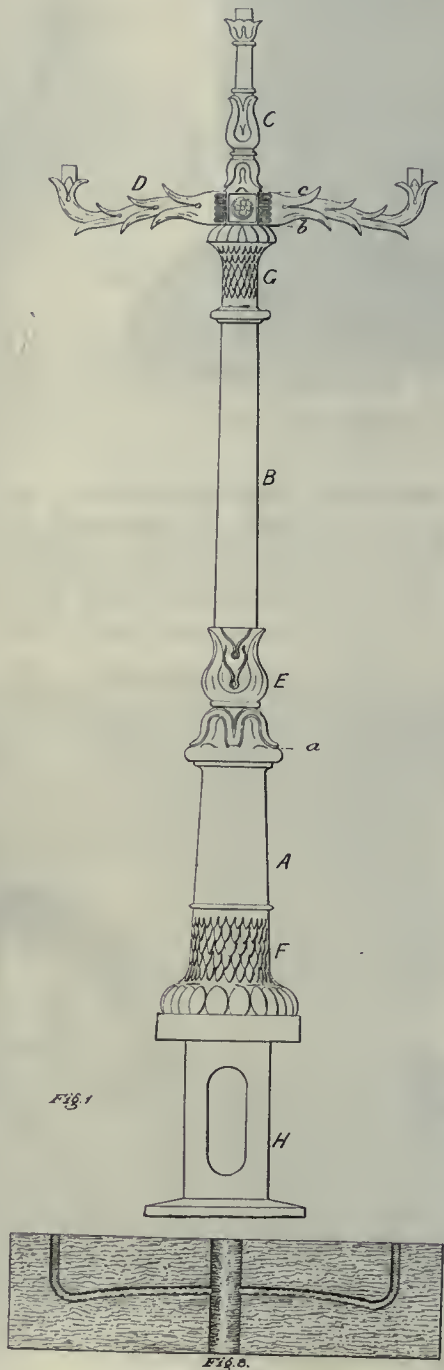
CARVED LAMP STANDARDS.—I.

By Joseph Horner.

At one period of my life I had a considerable amount of practice in the ornamental side of patternmaking, doing work on columns, lamp standards and railings, which entailed carving, in addition to the constructive work necessary in the building up. Little of this is done outside the shops where these things are a specialty, and when occasional jobs of this kind come in, the help of a professional wood carver is often sought. That aid is objectionable from one point of view, because the carver knows nothing of the moulder's requirements for delivery, and he instinctively undercuts in order to throw parts into bolder relief. The patternmaker must then go over the work afresh, spoiling some of the effect in order to provide for the necessary withdrawal of the patterns from the sand. An article or two on this aspect of patternmaker's work may be helpful to some readers.

Take first the lamp standard, Fig. 1, the pattern work for which was made by the writer a good many years ago. In all examples of this kind where there is considerable disparity in dimensions, the practice always is to build the casting up in separate pieces. Just in how many is a matter for judgment, so that alternatives are legitimately adopted. In this case, the casting was in four separate pieces, comprising the base (A), the shaft (B), the smaller lamp stem (C), and the cross arm (D), which carried a lamp at each end. Joints between these are made at (a), (b), (c), in spigot and socket style, usually with plenty of clearance to receive the lead poured around, and sometimes "stemmed" in, but having narrow chipping strips for centering and holding the parts. The strips ensure a fit, and the lead fills up and prevents rocking movements, and displacement afterwards.

The ornamental belt (E) might alternatively be made separately, and fitted to spigots on (A) and (B), or the lower portion of (F) might be so made, the upper portion being still cast with (B). These are details the settlement of which do not matter much one way or another, only that it is not desirable to multiply joints unless the preparation of the work is simplified by doing so. It is always simplified by making a joint between adjacent portions much larger and much smaller, as between (A) and (B), for reasons which a moulder will appreciate. Not only is the work of coremaking less troublesome, but the moulding boxes are simplified, and are more readily handled than when relatively



FIGS. 1 & 8. CARVED LAMP STANDARDS.

large and small parts are contained in one box. We will now consider the methods by which the pattern parts are prepared, and which apply in the main to all work of this kind.

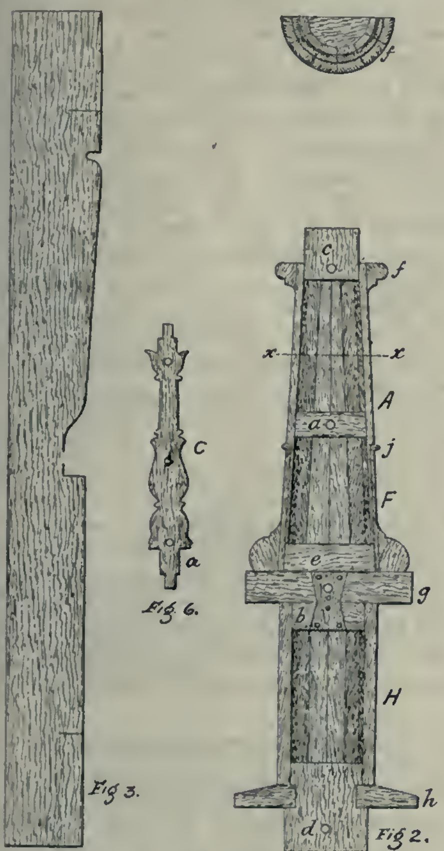
Preparation of Pattern Parts.

The base portion (A) being large, is lagged up, while (B) and (C) are turned in solid stuff, jointed and doweled, and (D) is jointed and doweled in the solid. The portions (E), (F), (G) were made in loose pieces, skewered on, otherwise the carved work could not have been delivered. The number of joints in the loose pieces depends on the undercut in the carved work. The fitting of the loose pieces to the pattern bodies may be made into turned recesses, or on flat angular facets, the latter being the better method. The details of this work are shown in subsequent figures which illustrate the patterns of the several portions of the lamp standard.

Fig. 2 shows the lower or base portion opened in the joint face. The plain circular parallel portion, or "root," (H)—compare with Fig. 1—which goes below the ground, is conveniently made separately from the other tapered portion. To lag the two up in one would require strips much thicker than need be used if the parts are made separately. The lagging strips are glued and screwed on across bars, (a), (b), (e), these being narrow strips, but the other bars, (c), (d), are prolonged to turn the core prints on, and to receive the flange (h) and the dovetail by which (b) is united to (e). The grain runs longitudinally in (c), (d). The lagging strips being of moderate thickness, say about $1\frac{1}{2}$ in., the mouldings and flanges are added. The upper moulding (f) is glued on in blocks, the grain running the same way as that in the lagging. The square flange (h) is fitted as most flanges are, by boring out a hole to fit over a turned neck on the body. Flange (g) which fits on the stone at the ground level, is made solidly, and screwed to the piece (e). The bead (j) is fitted and glued into a recess and turned in place. The carved base (f) is fitted around in pieces in a recess, first turned, and afterwards planed with flats.

The pieces are secured temporarily, either with paper joints or with fine screws while being turned to the sectional shape, after, which the ornament supposed to represent fish scales (compare with Fig. 1) is marked out and cut with chisels. Care must be taken that no edges shall be undercut in relation to the direction of delivery. The loose pieces may be held during ramming either with skewers from the outside or with screws from within. A core board is required, Fig. 3, which calls for no observation.

The main shaft (B) of the lamp standard in Fig. 1 is shown opened in the joint face in Fig. 4. The spigot and (a) fits into the hole cored in the top of the base (A), while the end (b) fits into



FIGS. 2. 3, 6. CARVED LAMP STANDARDS.

a hole cast in the arm (D). The core prints extend beyond these spigot ends as shown. The carved portions (E) and (G) are treated like the piece (F) was on the base in Fig 2. They are divided suitably for separate withdrawal, and they fit on facets, as shown in section, being cut in recesses and turned first on the body of the pattern. As before, undercutting in relation to the line of withdrawal of each piece must be avoided. Division of the portion (E) may be obviated and, instead, it may be glued solidly on the body if a little

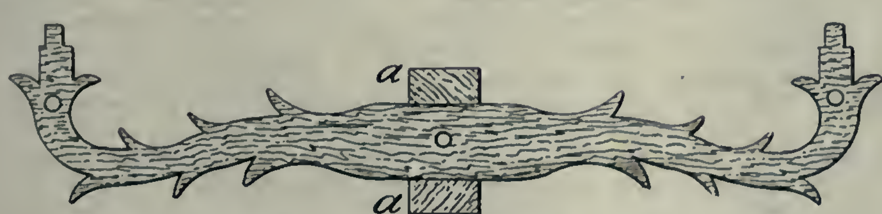


FIG. 7. CARVED LAMP STANDARDS.

detail is sacrificed. If the flanks are left smooth and the device shown in Fig. 1 is cut to deliver only in the bottom and top of the mould, it can be left solid. A little veining may be done at the sides if undercut is avoided, and the plain aspect be thus relieved.

The core board is shown in Fig. 5. It follows the outlines of the outside very closely, since there is only a slight amount of undercutting anywhere.

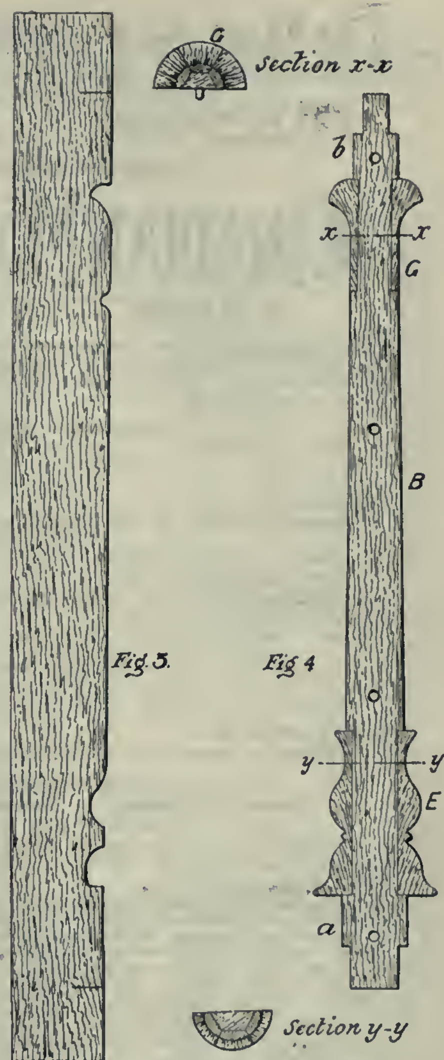
Fig. 6 shows the pattern of the top portion (C) of the standard, open in the joint face. It fits by the stem (a) into the hole in the top of the main shaft (B), and is cored through with a plain straight core. No portion is left loose, but the carving shown in Fig. 1 is done to deliver freely.

The arm pattern (D) is shown open in its joint face in Fig. 7. Nothing is left loose. The core prints (a), (a) are for the hole which receives the top of the stem (B). The timber grain in this pattern is weak where it curves upwards at the ends, but it is hardly a job for halving pieces in at right angles, being too flimsy. The best way is to cut the pattern in mahogany or other hard non-warping wood, and, if a considerable number of castings should be required, an iron pattern might be made. A core box is required, and a half box will do as seen in Fig. 8.

THREE CYLINDER LOCOMOTIVES.

AT the last Annual Convention of the American Railway Master Mechanics' Association, Mr. J. S. Bell read a paper on the subject of three-cylinder locomotives, in which he gave particulars regarding three of this type which have been giving good service on the Philadelphia and Reading Railway. The three cylinders are placed on the same horizontal plane, one between the frame and other two exterior to the frame. They have the same diameter, 18½ in., and each has its own piston valve. They have been engaged for several years in fast passenger service, principally on the New York division of the road, where they have been doing very satisfactory work.

Their principal advantages are that they secure a uniform turning moment, the cranks being placed at 120 degs.; they exert greater tractive power, and they call for a lower factor of adhesion than two-cylinder engines. They are easy on rails and bridges; afford opportunity for better balancing; and can be



FIGS. 3 & 4. CARVED LAMP STANDARDS.

operated on the simple, compound, or triple-expansion principle.

SEVENTY MILLION BUSHELS OF GRAIN IN TWO MONTHS.

IN the month of October, the C.P.R. moved 28,003 freight cars from Winnipeg to Fort William, the greater portion of which contained grain. To date, October 31, since September 1, there have been loaded on the Canadian Pacific Railway lines in the West, 49,149 cars of grain, 29,344 of which were loaded with wheat. The total grain moved this year from September 1 to October 31, was seventy million bushels.

Eightythree million bushels of grain were marketed at stations on the Canadian Pacific Western lines since September 1, three-fourths of it being wheat. In the same period last year forty million bushels were marketed.

From Port Arthur elevators on November 1, there were shipped 919,394 bushels of grain, a new high record for a day's shipment.

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Vol. X. NOVEMBER 6, 1913 No. 19

PRINCIPAL CONTENTS.

COMPRESSED AIR EQUIPMENT IN THE FOUNDRY.

ON a previous occasion, reference was made editorially to the place and value of compressed air equipment in the modern foundry, and while drawing attention to the article on the subject in the present issue, a moment's thought on what compressed air has made possible at the Annual Foundry and Machine Exhibition, through its easy production and transmission, leads the most unimpressionable of us to the conclusion that but for its place and part, much of the noticeable foundry progress would have been still unrecorded.

FOUNDRYMEN'S CONVENTION AND EXHIBITION.

THE recent Foundrymen's Convention and Exhibition in Chicago, easily broke record for attendance, as well as for class and variety of exhibits. The machine tool section was an added attraction on that occasion, and, for a first year, we believe, exceeded the most sanguine expectations of the promoters. It was just sufficiently successful to make those who held back feel somewhat chagrined that their product was not represented, and as a consequence, we look to see machine tool builders out in largely increased numbers when the 1914 show opens its doors.

The double function demonstrated that the progressive attitude displayed by foundrymen in recent years is becoming more accentuated in practical effort towards still greater achievement, and while the interest in this Annual Convention and Exhibition is not as widespread as it might and should be, there is no getting away from the fact that their influence is gradually permeating the ranks of employers and operatives in the direction of a more intelligent conception of the craft requirements, and of the results to be obtained by scientific and systematic investigation of the various factors entering into, and problems arising from foundry practice in each and all of its sections and departments.

The development of labor-saving tools and appliances goes on apace, a conclusion easily arrived at by a comparison between the recent Exhibition and its predecessors. In such circumstances, it is plainly evident that while much knowledge of the progress may be appropriated by the perusal of catalogue and circular matter, there is no gainsaying the strength of the appeal made by inspection of a machine and a demonstration of its accomplishments in operation. This annual show affords this latter opportunity.

The interest taken by Canadian foundrymen in this great objective, while encouraging and showing an annual increase in numbers of those who find it convenient and profitable to be in attendance, is not in any way commensurable with the extent and variety of the foundry business in the Dominion, and while there may be difficulties, more or less real, which bar a few, we believe that foundry proprietors fail in their appreciation of the investment value, not only of a first hand study of equipment and apparatus by having one or more representatives present, but fail to realize the benefits which a man receives in the way of encouragement and enthusiasm in his work, by meeting and associating with his fellow-craftsman.

As already mentioned, a machine tool section formed part of the recent Exhibition, and here as in the case of the general or foundry equipment, manufacturers showed products in operation, for the most part. It was meet that, at some stage of the game, the machine shop and foundry should get together, as there is much in common in their aims, and many problems that the combination can satisfactorily solve. The introduction of machine tools as a part exhibit will tend to widen the scope and influence of the Exhibition as a whole, and while in some quarters there may be a disposition to believe that the original idea and purpose is being somewhat lost sight of, we feel that the trend is wholesome, both for the foundryman and the machinist. A uniformly successful Exhibition record is not to be looked for, either by the large or small manufacturer, and all who have had their product regularly on display during recent years, have experienced more or less of the vicissitudes of business results irrespective of the increased general success. There is, of course, the risk of the small exhibitor being more or less snuffed out in the matter of display, yet the very circumstance should prove a welcome incentive to greater effort.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

	Mont'l.	Tor'to.
Grey Forge, Pittsburg.	.....	14 30
Lake Superior, charcoal, Chicago	.....	15 25
Middlesboro, No. 3	20 00	21 50
Carron, special	22 50	.....
Carron, soft	22 50	.....
Cleveland, No. 3	20 00	22 00
Clarence, No. 3	20 00	21 00
Jarrow	.....	23 50
Glengarnock	.....	26 00
Michigan charcoal iron	27 00	.....
Ferro Nickel pig iron (Soo)	.....	25 00
Victoria No. 1	19 15	18 00
Victoria No. 2	18 65	17 50

BILLETS.

	Per Gross Ton.
Bessemer billets, Pittsburgh	$23 00
Open hearth billets, Pittsburgh.	23 00
Forging billets, Pittsburgh	27 00
Wire rods, Pittsburgh	26 50

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto	2.10
Steel bars, f.o.b., Toronto	2.15
Common bar iron, f.o.b., Montreal.	2.10
Steel bars, f.o.b., Montreal	2.15
Bessemer rails, heavy, at mill	1.25
Steel bars, Pittsburgh, futnre	1.40
Tank plates, Pittsburgh, future	1.35
Beams, Pittsburgh, future	1.40
Angles, Pittsburgh, futnre	1.40
Steel hoops, Pittsburgh	1.60
F.O.B., Toronto Warehouse.	**Cents.**
Steel bars	2.25
Small shapes	2.35
Warehouse, Freight and Duty to Pay.	**Cents.**
Steel bars	1.80
Structural shapes	1.90
Plates	1.90

Freight, Pittsburgh to Toronto.

18 cents carload; 21 cents less carload.

IRON PIPE FITTINGS.

Canadian malleable, 40 per cent.; cast iron, 65; standard bushings, 70; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 77½; malleable, lipped unions, 65.

NAILS AND SPIKES.

Standard steel wire nails, base		$2 30
Cut nails	$2 60	2 65
Miscellaneous wire nails	75 per cent.	
Pressed-spikes, ⅝ diam., 100 lbs.		2 85

BOILER PLATES.

	Mont'l.	Tor'to.
Plates, ¼ to ½ in., 100 lbs.	$2.35	$2.30
Heads, per 100 lbs.	2.65	2.65
Tank plates, 3-16 in.	2.60	2.40
Tubes, per 100 ft., 1 inch	9.50	8.50
" " 1¼ in.	9.50	8.50
" " 1½ "	9.50	9.00
" " 1¾ "	9.50	9.00
" " 2 "	8.75	8.75
" " 2½ "	11.15	11.50
" " 3 "	12.10	12.50
" " 3½ "	14.15	14.50
" " 4 "	18.00	18.00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Stove bolts	80 & 7½
Machine bolts, ⅜ and less	65 & 10
Machine bolts, 7-16	60
Blank bolts	60
Bolt ends	60
Machine screws, iron, brass	35 p c.
Nuts, square, all sizes	4¼ per lb off
Nuts, Hexagon, all sizes	4½ per lb off
Fillister head	25 per cent.
Iron rivets	60, 10 p c off
Wood screws, flathead, bright	85, 10, 7½ p c off
Wood screws, flathead, brass	75, 10, 7½ p c off
Wood screws, flathead bronze	70, 10, 7½ p c off

National-Acme "Milled Products."	
Sq. & Hex Head Cap Screws	65 & 10%
Sq. & Hex Head Cay Screws	65 & 10%
Rd. & Fil. Head Cap Screws	45-10-10%
Flat & But. Head Cap Screws	40-10-10%
Finished Nuts up to 1 in.	75%
Finished Nuts over 1 in.	72%
Semi-Fin. Nuts, up to 1 in.	75%
Semi-Fin. Nuts over 1 in.	72%
Studs	65%

Disconnts f.o.b., Montreal.

OLD MATERIAL.

Dealers' Buying Prices.	Mont'l.	Tor'to.
Copper, light	$10 50	$11 50
Copper, crucible	14 00	14 50
Copper, uncr'bled, heavy	13 00	12 50
Copper wire, uncrc'bled	12 50	12 50
No. 1 machine compos'n.	11 00	12 25
No. 1 comps'n turnings	9 50	9 50
No. 1 wrought iron	10 00	9 00
Heavy melting steel	8 50	10 00
No. 1 machinery cast iron	13 00	14 00
New brass clippings	8 50	9 00
No. 1 brass turnings	7 25	8 00
Heavy lead	3 75	4 25
Tea lead	3 00	3 20
Scrap zinc	3 00	3 50

WROUGHT IRON PIPE.

The following are Toronto jobbers' discounts on pipe in effect from April 21, 1913:

Standard	Buttweld Black	Buttweld Gal.	Lapweld Black	Lapweld Gal.
¼ ⅜ in.	64	49	....	....
½ in.	68	58	....	....
¾ to 1½	73	63	....	....
2 in.	73	63	69	59
2½ to 3 in.	73	63	72	62
3½ to 4 in.	71½	61½	70½	60½
4½ to 6 in.	....	....	71½	61½
7, 8, 10 in.	....	....	66	54
X Strong P. E.				
¼, ⅜ in.	56½	46½	....	....
½ in.	64	54	....	....
¾ to 1½ in.	68	58	....	....
2 to 3 in.	69	59	....	....
2½ to 4 in	....	....	66	56
4½ to 6 in.	....	....	64	56
7 to 8 in.	....	....	55	45
XX Strong P. E.				
½ to 2 in.	43	33	....	....
2½ to 4 in.	....	....	43	33

PRICES OF WROUGHT IRON PIPE.

Standard. Nom. Diam.	Standard. Price. per ft.	Extra Strong. Sizes Ins.	Extra Strong. Price per ft.	D. Ex. Strong. Size Ins.	D. Ex. Strong. Price per ft.
⅛in	$ .05½	⅛in	$ .12	½	$ .32
¼in	.06	¼in	.07½	¾	.35
⅜in	.06	⅜in	.07½	1	.37
½in	.08½	½in	.11	1¼	.52½
¾in	.11½	¾in	.15	1½	.65
1 in	.17½	1 in	.22	2	.91
1¼in	.23½	1¼in	.30	2½	1.37
1½in	.27½	1½in	.36½	3	1.86
2 in	.37	2 in	.50½	3½	2.30
2½in	.58½	2½in	.77	4	2.76
3 in	.76½	3 in	1.03	4½	3.26
3½in	.92	3½in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4½in	1.27	4½in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.86	...	.....
7 in	2.38	7 in	3.81	...	.....
8 in	2.50	8 in	4.34	...	.....
8 in	2.88	9 in	4.90	...	.....
9 in	3.45	10 in	5.48	...	.....
10 in	3.20	....	....	...	.....
10 in	3.50	....	....	...	.....
10 in	4.12	....	....	...	.....

METALS.

	Mont'l.	Tor'to.
Lake copper	$17.00	$16.25
Electrolytic copper	16.75	16.25
Casting copper	16.75	16.00
Spelter	5.35	5.50
Tin	41.50	41.50
Lead	5.50	5.15
Antimony	8.50	9.00
Aluminum	22.00	18.00

SHEETS.

	Mont'l.	Tor'to.
Sheets, black, No. 28	$2.85	2.90
Canada plates, ordinary, 52 sheets	2 90	3 00
Canada plates, all bright.	4 00	4 15
Apollo brand, 10¾ oz. (American)	4 30	4 20
Queen's Head, 28 B.W.G.	4 40	4 40
Fleur-de-Lis, 28 B.W.G.	4 20	4 25
Gorbal's Best Best, No. 28	4 40	4 40
Viking metal, No. 28	4 40	4 40

MISCELLANEOUS.

	Cents
Putty, 100 lb. drums	$2.50
Red dry lead, 5 cwt. casks, per cwt.	6.00
Glue, French medal, per lb	0.10
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.26
Benzine, per gal.	23½
Pure turpentine	0.60
Linseed oil, raw	0.60
Linseed oil, boiled	0.63
Plaster of Paris, per bbl.	2.10
Plumbers' Oakum, per 100 lbs.	3.25
Pure Manila rope	17

COKE AND COAL.

Solvay Foundry Coke	$5.95
Connellsville Foundry Coke	5.80
Yough, Steam Lump Coal	3.88
Penn. Steam Lump Coal	3.68
Best Slack	2.99

All net ton f.o.b. Toronto.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents.

Montreal, Nov. 3, 1913.—Trade in most lines hos been a little quieter during the past week, but the falling off has not been serious, and is doubtless of a temporary nature. At all events, there are no signs of any diminution in the prevailing spirit of optimism. There seems to be no good reason why business during the coming winter should not be well up to the average of previous years. It is true that the banks are still somewhat chary of lending money for any but the most gilt-edged schemes, but for which it is probable that the building trade in Montreal would be quite active all through the winter, with a corresponding demand for structural steel, sheets, cement, etc. As it is, the next three or four months will see a slowing up in building operations.

There is nothing to record in the machine tool line this week. Before the end of the week, however, specifications will have been received for the machinery required for the repair shops and roundhouse of the Grand Trunk Pacific Railway at Prince Rupert, B.C. This business will not probably run into more than $12,000 or $15,000, but will nevertheless be keenly competed for.

With regard to the equipment for the new shops of the National Transcontinental Railway near Quebec, it had been expected that specifications would be sent out very soon, but later information from an authoritative source leads one to believe that they need not be looked for before the middle of December.

Metals.

Business in English and Scotch pig iron is now drawing to a close for this year, the last shipments being expected shortly. A brisk demand for these brands has been a feature of the market during the past couple of months, consumers buying readily in order to have a good supply for winter use. On the other hand, the demand for Canadian and American pig is dull, people buying in a hand-to-mouth fashion owing to the prevailing scarcity of money.

Copper, after a rise in the middle of last week, has fallen back again. There is little doing in this metal at the present time, consumers apparently having sufficient supplies on hand to enable them to hold off until the price drops somewhat. Conditions in the Lake Superior district continue to improve, and the Calumet and Hecla plants are now operating at 75 per cent. of normal output.

Lead remains firm at $5.50. Supplies are very scarce for immediate delivery, and the recent hopes of an early resumption of smelting operations in Mexico do not now seem very likely to be realized. There is, therefore, no immediate prospect of any relief from the present shortage of this metal, and while consumers continue to buy from hand to mouth, there is barely enough material to satisfy even this restricted demand.

Toronto, Ont., Nov. 3, 1913.—Some engineering concerns in and around Toronto are so busy they are putting on night staffs; some are so idle they are taking off day staffs. A traveler for a sheet firm told of visiting the plant of one of the largest stove manufacturers in Canada, this week. He found the workmen engaged in fixing lamps around the plant, and doing repair work. A representative of one of the largest metal concerns in Canada, said, "We're as busy as blazes, but doing nothing," and that seems as apt an expression to describe business just now as can be conceived.

Mention was made last week of the fact that makers of implements are sending machines West with no hope of receiving pay until November, 1914. Steel makers are handling such business very carefully, and are not anxious to supply material on such conditions. Extensions to plants are becoming rarer every week, as the banks are frowning on development work of this kind.

Regarding the cutting of structural steel prices by big engineering concerns and bridge builders, this cannot last long, and this method of obtaining quick money is frowned upon by most concerns. Dealers do not like it, as they are unable to compete, the vendors being their own customers.

One or two small railways have, this week, been calling for prices on rails, but enquiries of this nature are not taken very seriously. Despite the state of trade, railway schemes in Ontario seem to develop at a remarkable rate. T. J. Glover, promoter of the Forest Hill Railway, announced yesterday that he would spend $50,000 this year on construction work.

The price of bars is firm, and business is fair. No big volume of business has been done in wrought iron pipe, but the demand is steady.

New discounts on bolts and nuts were issued November 1 by the Steel Company of Canada. The reduction in price is made to meet competition across the line which, while not severe, is being met.

Drummond, McCall & Co. are not selling pig iron at all here, now. They carried that which is being made at Port Colborne for a while, but just to fill standing orders. They report the demand as slight. Contracts for steel to be used on the boat being built by the Collingwood Shipbuilding Co., have not been let.

A tool steel traveler who has just returned from the West, reports that the demand for tool steel is improving. Contractors on the new Welland Canal have not reached rock yet, and will not require steel for their rock drills for a month or more.

The Steel Company of Canada report good sales of pig iron at prices ranging from $18.50 to $19.00.

Machine Tools.

A dealer in machine tools returned from Western Ontario this week, where he found no demand for this class of machinery. The A. R. Williams Machinery Co., who are moving their warehouse, report a slight movement in woodworking tools. The demand for electrical equipment which has been slack, is now improving. This includes motors and portable electric tools. Dealers think the arrival of cold weather will help business.

Metals.

The metal market is dull. There is no drop in prices, and no big sales. Business is still conducted in a hand-to-mouth manner.

St. John, N.B., November 3.—Definite announcement is expected next week regarding the possibility of the Ford Motor Co. having a branch at St. John in connection with the development of their automobile business. It is said here that they will take over from the Maritime Motor Co. a portion of their large plant at Coldbrook, and will operate it at first for the assembling of the parts of their cars, and later possibly for their manufacture. Whether this is correct or not will not be known definitely for a few days, but the first part of it at least is quite generally believed.

The Maritime Motor Co. have finished their season of active manufacturing at their Coldbrook plant, and the operations during the winter will consist mostly of repair work and renewals. The next manufacturing season is expected to be a comparatively busy one, and plans cause the anticipation of at least 300 cars being built at the Coldbrook works.

If present plans are completed satisfactorily, the new grain conveyors to be erected at Sand Point, St. John harbor, will be finished in February. Nearly one hundred men are now at work upon them, and more are to be added later. Two 75-horse power motors are to be erected in a tower which is to be attached to the conveyors.

Local manufacturers and merchants throughout the Maritime Provinces are keenly interested in the matter of the opening of the winter port season this month, and matter now in dispute between the City and the Government as to whether or not the port of St. John will lose the regular sailings of some lines. Delegations from the Board of Trade have interviewed the Cabinet at Ottawa regarding the question, and they have urged the cancellation of an agreement between the I.C.R. and C.P.R. in which they claim St. John's interests are being discriminated against in the matter of freight rates.

Prospects of power development at Meductic, above Fredericton, N.B., are more promising since the report of the International Commission on the St. John River, that the dams which the St. John Hydro-Electric Co. propose to construct, would not violate the terms of the Ashburton treaty. Plans for the power development have reached quite an interesting stage, and the Government may be asked to decide as to which is the more valuable, the salmon fishing industry which may be injured by the dams, or the development of the power possibilities which are said to be really remarkable.

The development of the gas well at Moncton is being pushed ahead vigorously, and a new well was struck this week at a depth of only fifteen feet. It is thought that the gas area extends for quite a distance in Albert county. Manufacturers in the "railroad city" and merchants generally are decidedly pleased with the possibilities of much cheaper power and gas.

Kingston, Ont.—The Canadian Locomotive Works Co. gave $3,000 to the widow of Melville Knapp, who sustained fatal injuries at the works on September 15. The Company also paid the funeral expenses. The Coroner's jury decided that Knapp was at fault in doing work that he was not called upon to do, but his willingness gave the opportunity to the company to manifest this regard for his good services.

Montreal, Que.—Mr. Justice Beaudin recently dismissed a petition for an injunction which entailed a serious principle, namely, whether a firm can lawfully bind an employe not to work for another firm, after he has left the first one. The Canada Metal Co, of Toronto, sought to have John Berry, a commercial traveller, prevented by the court from acting in that capacity for a rival firm, Lazarus, Cohen & Co., because he had signed with the Canada Metal Co. In the contract he had pledged himself not to work for another Company for one year after he left the Canada Metal Co. The court took the view that a man's right to earn his livelihood could not be tampered with, and except for very serious reasons, and as in the present instance, he could be replaced easily, there was no ground for preventing him from working in the employ of another company. The same principle has been affirmed before by the courts, including the Court of Appeal.

Montreal, Que.—The Dominion Iron & Steel Co. was, last week, condemned to pay the Mechanical Equipment Co. the sum of $13,000 claimed by the latter as the contract price of two nail making machines manufactured and delivered to defendant by the plaintiff. Action had been entered against M. J. Butler, the late vice-president of the Dominion Iron and Steel Co. as well as against the company itself. In the course of the hearing it was shown that the defendant, Butler, had negotiated the purchase of the machinery, but the court held that the action should be dismissed as far as he was concerned, because in his dealings with plaintiff he had not acted in his individual capacity but as an officer of the defendant company. The claim was opposed by the company on the ground that the machines did not pan out as expected and as stipulated in the contract. The hearing of the case occupied a couple of weeks, in the course of which voluminous testimony of a highly technical character was rendered. As a net result, Mr. Justice Dunlop found the claim well founded as against the company. The defendant had ordered three machines, and after delivery of the first, refused to take delivery of the second, which, however, was delivered and received on the premises under protest. The order for the third was then countermanded. The first was paid for as soon as delivered. The second was never given a trial, as the company expressed dissatisfaction with the first and presumed the second was no better.

The court, after summing up the evidence of a few nail machine operators brought from the States, held that the defendant had failed to prove that the first machine was incapable of doing the work which it was intended to do. It was in fault for not having given the second at least a trial. As the concern had entered into a contract to buy the machines at a certain price, it was incumbent upon it to pay the price stipulated.

INFORMATION FOR INVENTORS.

PIGEON, Pigeon & Davis, Patent Solicitors, St. James St., Montreal, report that 128 Canadian Patents were issued for the week ending October 7th, 1913, 83 of which were granted to Americans, 23 to Canadians, 11 to residents of Great Britain and Colonies and 11 to residents of Foreign countries.

Of the Canadians who received Patents, 14 were residents of Ontario, 4 of British Columbia, 2 of Quebec, 1 of Saskatchewan, 1 of Nova Scotia, and 1 of New Brunswick.

In the United States for the same week, 725 Patents were issued, 5 of which were granted to Canadian inventors.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Engineering

Ft. William, Ont.—The Orpen Conduit Co., 165 King St. W., Toronto, intend erecting a plant here.

Sydney, N.S.—A new 40-ton Morgan electric crane has been installed by the Steel Co. at their plant here.

Petrolea, Ont.—The ratepayers have voted $30,000 to enable the Petrolea Wagon Co. to make extensions.

Caledonia, Ont.—A new machine and foundry shop has recently been started here by Messrs. Logan, of Barrie.

Biggar, Sask.—The G.T.P. will add twelve or more stalls to its roundhouse, and will add a large machine shop.

London, Ont.—A small blaze at the Stewart foundry gave the firemen a run last Saturday night. The damage was small.

Kingston, Ont.—The ratepayers have granted a bonus of $75,000 to the Kingston Iron and Tube Co., who will erect a new plant here.

Hamilton, Ont.—Fire did $200 damage to the plant of the National Machine & Supply Co. at 48 Market St. on Saturday, October 25.

Toronto, Ont.—Roden Bros., silversmiths, have been granted a permit for a 3-storey factory, near Wilton Ave., costing $40,000.

Regina, Sask.—Plans are being prepared for a warehouse and repair shop for the Emerson, Brantingham Implement Co., Rockford, Ill.

Fort William, Ont.—J. O. Callaghan announces that when the wire factory now under construction here is completed, several other plants will be constructed.

Toronto, Ont.—The reorganization committee of the Lake Superior Iron and Chemical Co. has given notice that the plan agreed to last June is now operative.

Transcona, Man.—The tracks for the car shops are now completed, and the engineer, H. H. Pinch, and master car builder, J. J. Hodgson, are busily engaged installing the machinery.

New Hamburg, Ont.—The Silversmith Co. have let the contract for a large addition to their present factory, the building to be 70 by 40 feet, three storeys high, built of brick.

Curling, Nfld.—F. G. Brake is going to Bridgewater for the winter to study engineering and machine work, and, with the aid of a partner, intends to start a repair shop on his return.

Fort Erie, Ont.—Toronto and Cleveland capitalists have taken options on 100 acres of land here, and will build a factory for the manufacture of automobiles and heavy grade motorcycles.

Goderich, Ont.—The American Road Machine Co. of Canada will manufacture galvanized iron goods in their present factory when the new one is finished. They ask the town for a loan of $50,000.

Kingston, Ont.—On November 3 the ratepayers will vote on a scheme to bonus the Kingston Iron and Tube Co., capitalized at $1,000,000, employing 180 men, and paying $125,000 a year in wages.

Port Arthur, Ont.—Engineer A. B. Edwards was in Port Arthur last week making all preliminary arrangements for commencing the erection of buildings of the Conley Frog and Switch Co. early next spring.

Victoria, B.C.—McDonald, Godson & Co., the lowest tenderers for steel riveted pipe in connection with the Sooke water scheme, have been awarded the contract, and will erect a factory in Victoria, to do the work.

Winnipeg, Man.—The Empire Waterworks Supply Co. of Canada, Ltd., have been incorporated at Winnipeg, and will manufacture waterworks supplies of various kinds, including piping, etc. The company is capitalized at $100,000.

Coquitlam, B.C.—Coquitlam has been selected as a grain elevator site by a group of Fort William, Minneapolis and Winnipeg capitalists, according to word received recently. The syndicate is headed by Mr. J. H. Henderson of Fort William.

Calgary, Alta.—Mr. Griffin, the senior partner of the Griffin Wheel Co., of Chicago, will presently pay a visit to this part of Western Canada with a view to selecting a suitable location for a large plant. Between 1,500 and 2,000 men would be employed.

St. Marys, Ont.—A 70-feet addition to C. Richardson & Co.'s dairy utensil factory on Wellington Street is being rushed with all possible speed, so as to have the building roofed in before hard weather sets in. The building will be two storeys high, and built of stone.

Saskatoon, Sask.—C. J. Buckeye, of Buckeye Engine & Foundry Co., Joliette, Ill., will locate a plant at Factoria, near here, if the city will come to terms. He will erect a machine shop, 50x150, a foundry 40x70, and a storeroom and boiler house. Sixty to one hundred men will be employed.

Winnipeg, Man.—The Good Roads Machinery Co. have been incorporated at Winnipeg to build road making machinery. This concern was organized by William E. Clark, president of the Carbon Oil Works, Ltd., and the company have a temporary office on the fifth floor of the Maltese Cross Building.

Brantford, Ont.—At a meeting of the directors of the Brantford Motor Truck Co. on October 28, the concern was put into liquidation, and J. S. Dowling was appointed liquidator. Fifty thousand dollars was required to keep the business afloat, and the directors do not care to spend this amount.

Montreal, Que.—It is reported here that W. W. Butler, vice-president of the Canada Car & Foundry Co., is organizing another car company to be known as the W. W. Butler Co., Ltd., with $100,000 capital.

Medicine Hat, Alta.—The city has voted a free site, free gas and water to the Western Threshing Machine Co., which is capitalized at $100,000, and work will be started on the manufacture of threshing machines as soon as possible. J F. Davies is president; V. W. Parrish, secretary, and H. B. Yuill, treasurer.

Levis, Que.—The question of the re-opening of the machine shops of the Canadian Shoe Machinery Company, at present in liquidation, was discussed at a meeting of the Levis Town Council last week. A syndicate of capitalists, headed by C. H. Carrier, formerly of the firm of Carrier, Laine & Co., are prepared to open up and carry on a large machinery business if they can secure the lease of the premises. The syndicate guarantees to employ between 350 and 400 men. The council decided to recommend the Minister of Public Works to consider the proposition of the Carrier syndicate.

Winnipeg, Man.—Plans for the new engineering building in connection with the Manitoba University at St. Vital are now in the hands of Professor Brydon-Jack. The building will be 200 feet long and 75 feet wide, three storeys in height, with basement. In addition it will have two "L" wings, each 70 feet long and 40 feet wide, two storeys in height. Construction will be commenced as soon as possible.

Almonte, Ont.—A foundry will be opened by Kir-Benn, Ltd., a company recently incorporated with $200,000 capital. A general meeting of shareholders was held on Wednesday, Nov. 5, for purposes of organization. T. W. Kirby, of Hamilton Stove & Heater Co., has been appointed manager, and the plant should be operating by January. Alfred M. Greig and Wm. H. Stafford, Almonte, are interested. Stoves and furnaces will be made.

Electrical

Burford, Ont.—An effort will be made to get Hydro-Electric power here.

St. Catharines, Ont.—The ratepayers have voted in favor of Hydro-Electric power.

Quebec, Que.—The Dorchester Electric Co. will improve the lighting in Limoilou.

Grantham, Ont.—The Ratepayers of this township are asking for Hydro-Electric rates.

South Bolton, Que.—A steam power plant will be installed by Mr. Houldsworth in his mill.

St. Mary's Ont.—$5,870.30 has been passed for extension and improvement in water and electric light works.

Elmira, Ont.—Hydro-Electric power was formally installed in Elmira on October 29. The village will take 250 h.p.

Moose Jaw, Sask.—The Kasow Electric Co., and the A1 Electric Co., both of Moose Jaw, have assigned in favor of creditors.

Winnipeg, Man.—The Provincial Government will erect a power house to cost $158,000. General contractors, National Construction Co.

Port Arthur, Ont.—The C. N. R. are installing an electric plant at Atikokan, the chief divisional point between Port Arthur and Fort Frances.

Vancouver, B.C.—The city is seeking additional water power. Ald. Black, chairman of the civic water committee, has been to Victoria about it.

Victoria, B.C.—The city council has authorized improvements to the city's electric light plant, which will provide workshop facilities for the employees.

Strathroy, Ont.—The ratepayers must either take Hydro power or spend a large sum on the municipal plant. The wiring is bad, and a new boiler is required.

Grantham, Ont.—The township has been offered electric power by the Hydro-Electric Commission at very low rates. $38,000 will be spent on construction.

New Glasgow, N.S. — The Pictou County Electric Co. have purchased new equipment, consisting of boilers, engines, generators, etc., for their power plant at Stellarton, N.S.

Owen Sound, Ont.—The Council has authorized the Mayor to sign a contract with the Hydro-Electric Commission for twelve to fifteen hundred horse-power from Eugenia Falls.

Montreal, Que.—The Laurentide Pulp and Paper Co. will drive all their machinery by electricity when the new power house supplying 100,000 h.p. is completed.

Winnipeg, Man.—A by-law has been passed by the city council for a vote of the ratepayers on the expenditure of $1,000,000 for extension to the hydro-electric system.

Brockville, Ont.—A by-law has been passed by the Council of Brockville for raising the sum of $69,000 for the improvement and extension of the present light and water systems.

Prince Albert, Sask.—The city will ask the Legislature to allow it to borrow $2,500,000 for construction work on the Lacolle Falls power plant, and to extend the time for completion for a period of three years.

Davidson, Sask.—The Canada Gas Producer Co., of Barrie, Ont., propose to instal an 80 h.p. gas engine and electric generator, together with a gas producer and other necessary equipment, for $8,500, in the town's power house.

Orillia, Ont.—The Water, Light and Power Commission, represented by J. B. Tudhope and C. H. Hale, has asked the council to consider a by-law to raise $80,000 for new machinery and equipment in the new power house to be built at Swift's Rapids.

Toronto, Ont.—It is definitely settled that the Provincial Hydro-Electric Commission will issue an order for the installation of street lights and house services in Swansea and Runnymede within the next month or two.

Winnipeg, Man.—The Winnipeg Electrical Railway has secured the Great Falls Power Co. waterfall on the Winnipeg River, situated midway between Lac Du Bonnett, the Electric Railway Co.'s present site, and mouth of river.

Hamilton Hydro Report.—The financial statement of the Hamilton Hydro-Electric Department shows a gross profit of $26,000, and a net profit of $6,000 for the past eight months. Engineer Sifton says $335,264 is needed to complete the system.

Nelson, B.C.—Construction work on the new units for the West Kootenay Power and Light Co., at Bonnington Falls, to supply power to operate the Rossland-Castlegar division of the C. P. R. will commence on January 1. The machinery has been ordered.

Ottawa, Ont.—Plans and description of the site of proposed water power development at High Falls, on the Madawaska River, in the County of Renfrew, have been filed at Ottawa. This is probably for the Ontario Hydro-Electric Commission.

Port Arthur, Ont.—The city solicitor has been authorized to prepare by-laws for the following: $8,000 for street lighting; $35,000 for street railway extensions; $35,000 for a telephone system; $50,000 for a high tension power line.

General Industrial

Berlin, Ont.—Arthur Forster, 123 King St. E., will build a twine factory. Plans are being prepared.

Quebec, Que.—"Le Soleil," a daily newspaper, suffered considerable loss to its plant by fire last week.

Revelstoke, B.C.—A company capitalized at $25,000 is being formed in Revelstoke to build and equip a new steam laundry.

London, Ont.—The factory of the London Bed and Mattress Co. was gutted by fire on October 27. The loss will total $30,000.

Winnipeg, Man.—The Canada Malting Co., Williams Ave., lost their plant by fire on October 28. The loss amounted to several thousand dollars.

Montreal, Que.—The Canadian Cereal & Flour Mills, Ltd., is in the hands of a receiver, and the mills may be turned over to their original owners.

Cardston, Alta.—A milk condensing plant capable of handling 22,000 quarts a day, will be built here. The Board of Trade has the matter in hand.

Edmonton, Alta.—The Public Works Department of the Alberta Government intends to construct a bridge over Saskatchewan Avenue at Eighth Street.

Berlin, Ont.—Gourlay & Fogelberg are erecting a shoe factory, costing $26,000.

Stanbridge East, Que.—G. W. Sadler & Co., are making an extension to their plant.

Cobalt, Ont.—The Dane Mining Co., working a copper property near Dane, on the T. & N. O. Ry., has lost nearly all its surface equipment by fire. Loss of about $5,000.

Toronto, Ont.—Fire did damage to the extent of $40,000 in the building at 39 to 43 Pearl Street, last week, occupied by Alexander & Cable Lithographing Co., Ltd., and others.

Revelstoke, B.C.—The Lakes, B.C., Canning Co. propose to build and equip a factory on Arrow Lake, south of Revelstoke, for the purpose of canning fruit and vegetables.

Vernon, B.C.—J. H. Christie has organized a syndicate backed by Kelowna capital, which will immediately open up coal properties on Short's Creek, about twenty-five miles from Vernon.

Beeton, Ont.—The Beehive flour mill, owned by Aitken & Son, was destroyed by fire Saturday, October 25. The loss is $13,000, covered by insurance. Recently new electrical machinery was installed.

Brantford, Ont.—On account of the lease held on the property expiring, James Workman has found it necessary to close up Workman's brick plant, which is to be offered for sale by auction.

Peterborough, Ont. — The Vermont Marble Co. expect to commence manufacturing operations this week in their new plant. T. M. Howard, Jr., is manager of the plant, and Mr. Holden, superintendent.

Fort William, Ont.—The elevator of the Ogilvie Flour Mills Co., Ltd., will undergo material changes in the near future. The shipping facilities will be enlarged to a capacity of 20,000 bushels of grain per hour.

Grimsby, Ont.—The Pelee Island Wine and Vineyards Co. will close its two plants at Sandwich and Pelee Island, and move everything to Grimsby. If given a bonus, they will erect, instal and equip a modern wine factory.

Sarnia, Ont.—Stuart, Limited, jam makers, are planning a new factory building to take care of their rapidly increasing business. They are contemplating the manufacture of new lines. Sarnia will probably lend them $15,000.

London, Ont.—Two new industries will come here within the next two weeks; one is an American concern with a capital of $40,000,000, who have secured an option on land along the London and Port Stanley tracks.

London, Ont.—The C. N. W. Shoe Co. may ask the city council to put before the electors a by-law in January, asking for a loan of $20,000 to enable the company to build a factory in this city; otherwise they will build elsewhere.

St. Catharines, Ont.—D. B. Hanna, vice-president of the C. N. R., has assured the council that work will be started right away on their branch of the Toronto to Buffalo line. They have given a bonus of $75,000.

Toronto, Ont.—Thomas Shortiss, proprietor of the Quaker Candy Co., has purchased from H. L. Wood the property at 422 to 426 Queen Street East, and will erect a four-storey stone and steel building.

Lethbridge, Alta.—The Rice Malting Co., or the Lethbridge, Alberta, Malting Co., Ltd., will erect a malting plant and elevator with a capacity of 350,000 bushels, costing $150,000. P. H. Rice, Winnipeg, is the owner. The plant will use 250 h.p. of electricity.

New Westminster, B.C.—The erection of a passenger depot on the south side of Columbia Sfreet opposite Church Street and the construction of its line through the business section of the city on a double track trestle on a level with Columbia Street is planned by the Canadian Northern Railway according to preliminary plans of the company that came up for consideration at a special meeting of the council last week.

Montreal, Que.—On October 29 fire occurred in the Union Cold Storage building at Wellington and Colborne Street, resulting in a loss of approximately $100,000. The following firms suffered damage: The Industrial Mfg. Co., The Factory Waste and Metal Co., Dominion Machinery Supply Co., Canada Office Furniture Co., Canada Machinery Agency, and The Ives Modern Bedstead Co. All had adequate insurance protection.

Vancouver, B.C.—With their decision to form the Wall Street Waterfront Association, owners of property on the Inlet, between Trinity and Renfrew Streets, took the initial steps to develop their property for industrial purposes. The officials elected were: Alderman Woodside, president; Mr. H. G. Ross, vice-president; Mr. J. J. Taylor, secretary; Messrs. P. Mason, V. W. Heywood, Stuart Livingstone and A. C. Ray, executive committee. Several of the owners are in a position to start up some new industries.

Wood-Working

Dowe Creek, B.C.—Senator Edwards, Ottawa, and associates are preparing to build a large sawmill here.

Fanny Bay, B.C.—The Weeks Dunell Cedar Co. has been incorporated, and will build a shingle mill.

Vancouver, B.C.—The Joseph Chew Lumber Co. contemplates building a sawmill at Craycroft Island, B.C.

Saskatoon, Sask.—Frank Giddings is at the head of a Company who plan the erection of a furniture factory here.

Saint Martin, Que.—The Saint Martin Lumber Mfg. Co. has been incorporated by J. A. E. Decelles, J. W. Lavoie and others.

Thorold, Ont.—The new plant of the Beaver Board Co. will be running by next spring. Most of the machinery has been purchased.

Arkona, Ont.—The Arkona basket factory has been sold to River Bros., of Watford, who take possession immediately. It is understood that the factory will be much enlarged.

Goderich, Ont.—The Kensington Furniture Co., whose plant was burned down some time ago, are raising $20,000, and will build a factory three storeys high, 150 x 60 ft., and employ 100 hands.

New Incorporations

Ottawa Traction Co. Ltd., incorporated at Ottawa, capital $10,000,000, to construct or acquire, by lease, electricity at Ottawa, Incorporators: John F. Orde, Burns Moir, etc.

Napoleon Mill, Ltd., incorporated at Ottawa, capital $75,000, to exploit the Lauziere patent relating to wind-mills, at Drummondville, Que. Incorporators: Napoleon Garceau, Alexandre Mercure, etc. Drummondville, Que.

The W. W. Butler Co. Ltd., incorporated at Ottawa, capital $100,000, to buy, sell manufacture and deal in all kinds of railway apparatus, at Montreal. Incorporators: John Augustine Mann, Cecil G. MacKinnon, etc. Montreal.

Cobalt Reduction Co. Ltd., incorporated at Toronto, capital $350,000, to prospect for, open, explore, develop, work gold, silver, copper, etc., offices at Toronto. Incorporators: Armand Chenier, Pearl Stokes, ets. Toronto.

Coleman Fare Box Co. Ltd., incorporated at Toronto, capital $75,000, to manufacture fare boxes, and other appliances, at Toronto. Incorporators: Acton Burrows, William H. Knowlton, etc. Toronto.

Heinze Electric Co. Ltd., incorporated at Toronto, capital $50,000, to manufacture and deal in electrical apparatus and supplies, at Walkerville, Ont. Incorporators: Paul Butler, Butler Ames, etc. Lowell, Mass.

Atlantic Coast Steamship Co., Ltd., incorporated at Ottawa, capital $500,000 to build, equip, or otherwise acquire and hold ships and vessels, at Toronto. Incorporators: Reginald H. Parmenter, Arthur J. Thomson, etc., Toronto.

Scroggie Furniture Co., Ltd., Incorporated at Ottawa, capital $100,000, to carry on the business of manufacturers and importers of all kinds of furniture, at Montreal. Incorporators: Arnold Wainwright, Maurice Alexander, etc., Montreal.

Gray Pneumatic System, Ltd., incorporated at Ottawa, capital $500,000, to acquire and work inventions and patents for pneumatic systems of starting internal combustion engines, etc., at Toronto. Incorporators: John M . Duff, Frank Regan, etc, Toronto.

The Pierson Gas Producer Plant Co. Ltd., incorporated at Ottawa, capital $100,000, to import, manufacture and fit up the Pierson gasogenes, with motor and all necessary machinery, at Montreal. Incorporators: Pierre V. Rougier, Arthur Decay, etc., Montreal.

Van Buren Excavator Co. Ltd., incorporated at Ottawa, capital $75,000, to carry on the business of manufacturers of iron and wood-working tools and machinery, etc., at Toronto. Incorporators: William A. James Case, Harris, E. Wallace, etc., Toronto.

The Valleyfield Water Power Co., Ltd., incorporated at Ottawa, capital $1,000,000, to carry on the business of an Electric Light, Heat & Power Company in all its branches, at Salaberry de Valleyfield, Que. Incorporators: Noel A. Ostiguy, John Lowe, etc., Salaberry de Valleyfield.

Tenders

Welland, Ont.—The John Inglis Co., Toronto, are tendering on a 1,000,000 gallon pump required for the waterworks.

Ottawa, Ont.—The Public Works Department will call tenders shortly for the construction of concrete piers at Victoria, B.C., to cost $2,000,000.

Calgary, Alta.—Tenders are being received by the City Clerk until November 16, for a 1,000 K.W. Synchronus Motor-Generator and Exciter Set.

Salmon Arm, B.C.—The town clerk has been instructed to call tenders for the erection of a concrete oil tank for power house, to have capacity of 12,000 Imperial gallons.

Ottawa, Ont.—The tenders for the first section of the Halifax terminals for the Intercolonial Railway were opened last week, but were found unsatisfactory. New tenders will be called for.

Ottawa, Ont.—Tenders, marked "Tender for Section No. 5, Welland Ship Canal," will be received until Tuesday, November 18, 1913. L. K. Jones, Asst. Deputy Minister and Secretary, Department of Railways and Canals.

Ottawa, Ont. — Tenders endorsed, "Tender for Construction of Wharves at Victoria Harbor, B.C.," will be received until Tuesday, December 9, for the construction of wharves at Victoria Harbor, B.C. R. C. Desrochers, secretary. Department of Public Works.

Victoria, B.C.—The city council has rejected the bids for the telephone line and the street pressure pipe line of the Sooke Lake work, and decided to call for new bids, the city electrician to be instructed to also put in a bid on the work. The new bids will be both for the work as a whole and in part. The Water Commissioner and Consulting Engineer had recommended letting the pipe line work to the McDonald, Godson Co., of Vancouver, for a price of $444,998, but this was thrown out too.

Municipal

Fort Francis, Ont.—$12,000 for telephone purposes was finally passed by the council.

Todmorden, Ont.—Ratepayers are urging fire protection and a better water system.

Salmon Arm, B.C.—The council hope to secure $12,000 to complete the waterworks system.

Edmonton, Alta.—The city is building an asphalt plant to cost $5,000, two storeys, 27x53.

Sudbury, Ont.—The council will extend its water mains at a cost of $5,000. Clerk, George Elliott.

Peachland, B.C. — The Corporation will spend $1,000 on additions to the electric lighting system.

Welland, Ont.—The council is considering the supply of water to Crowland. The cost of the extension would be $1,500.

Hamilton, Ont.—The ratepayers will vote on a scheme to raise $200,000 for a new hospital, in January.

Toronto, Ont.—Works Commissioner Harris will again recommend the purchase of a stone quarry by the city.

Hull, Que.—The Hull City Council will begin at once the construction of the macadamized road between Hull and Gatineau Point.

Weston, Ont.—The Weston Water, Power and Light Commission have decided to lay a 4-inch water main on the north side of St. John's Road, at the request of the York Colonization Co.

Medicine Hat, Alta.—The city council will submit to the vote of ratepayers upon November 21st, a by-law for the appropriation of $50,000 to be used in grading and gravelling streets, and for the purchase of the plant and machinery.

Bow Island, Alta.—The municipal gas well at Bow Island, with a capacity of 10,000,000 cubic feet per day, has been completed. The money has been raised by local subscription, and free gas is being offered for new industries which wish to locate there.

Medicine Hat, Alta.—The ratepayers will shortly vote on the following bylaws: $50,000 for grading and graveling the streets; $12,000 for apparatus for fire department; $60,000 for building storm sewers, and $150,000 for extensions to light and power plant.

Winnipeg, Man.—C. F. Roland, industrial commissioner, has left for Great Britain, where he will take up the question of financing the proposed industrial buildings to be located on the old exhibition grounds. The scheme is to erect, in units, buildings to cost ultimately $10,000,000, the buildings to be used by small manufacturers.

Railways—Bridges

London, Ont.—The G. T. R. will build a line to Port Burwell as soon as possible.

Toronto, Ont.—The Metropolitan division of the Toronto and York Radial Railway will erect new terminals.

Medicine Hat, Alta.—The C.N.R. will start to build its line here next spring, and have the line to Hanna finished by 1915.

Toronto, Ont.—An electric railway from Toronto to Whitby is proposed, via Markham, Uxbridge, Brooklin and Port Perry.

Winnipeg, Man.— The city will soon ask the citizens for $150,000 with which to build a bridge over the Assiniboine River.

Vancouver, B.C.—The Railway Commissioners have approved plans for the southern approach to the Second Narrows bridge.

Hamilton, Ont.— Geo. F. Webb has been given permission to construct an incline at the head of Wentworth street to replace the present one.

London, Ont.—The proposed electric railway from London to Grand Bend is making good progress, according to the promoter, T. C. McAllister.

Owen Sound, Ont.—The Board of Trade has decided to ask the Hydro-Electric Commission to run a radial line from Guelph to Owen Sound.

St. Catharines, Ont.—The city council have passed a by-law authorizing an additional loan of $10,000 for the completion of the Ontario street bridge.

Saskatoon, Sask.—Plans and specifications are being completed by the C.N.R. for a pumping station in Saskatoon at an estimated cost of $15,000.

Ottawa, Ont.—In January, 1914, the residents of the town of Eastview will vote upon the question of extending the Ottawa Electric Railway line into Eastview.

Ottawa, Ont.—The Intercolonial Railway is about to award contracts for a large number of cars, which will probably go to the Eastern Car Co. and the Nova Scotia Car Co.

Toronto, Ont.—Frank Barber, engineer for York Township, has completed plans for a high-level bridge over the West Don River, alongside the C. P. R. viaduct No. 3.

Hamilton, Ont.—The C. P. R. has purchased a right-of-way through the south end of the city as a new route from Toronto to Buffalo. The cost of work in Hamilton will be $400,000.

Edmonton, Alta.—The Government is considering encouraging the Canada Central Railway and other lines to run lines into the Peace River district and Blindman Valley district near Lacombe, etc.

Vancouver, B.C.—O. S. Bowen, assistant chief engineer of the Great Northern Railway, states that the Company will shortly commence the construction of a viaduct over the Grandview cut on Commercial Street.

Ottawa, Ont. — The Ungava Railway Co. has given notice of application to Parliament for legislation authorizing the construction of a railway from the mouth of the Great Whale River, on the east coast of Hudson's Bay, to Aylmer Sound, on the Gulf of St. Lawrence.

Guelph, Ont.—The city council strongly favors a scheme for the construction of an electric railway from Hespeler, connecting with Puslinch Lake, through Guelph to Elora, Fergus and Arthur, and also from Arthur connecting with Mount Forest, through the Beaver Valley to Meaford or Thornbury.

Quebec, Que.—A proposition has been submitted by the Champlain Realty and Elevator Co. for the construction of a passenger elevator leading from the foot of Mountain Hill to the heights at Frontenac Park. The company, of which J. G. Scott is president, would have the elevator in operation by May, 1915.

Quebec, Que.—A tunnel will be drilled through the rock on which Quebec is situated. The tunnel will begin at Lampson's Cove, and will come out at St. Malo, near the site of the Transcontinental shops. It will obviate the alternative plan of connecting the sections of line east and west of the city by running a track around the congested water-front.

Winnipeg, Man.— Work on the new Provencher Bridge, which will cross the Red river diagonally, is being proceeded with rapidly. Number 6 pier has started and the contractors intend working through the winter, hoping to have the bridge ready for traffic by late next fall, when it will provide a direct route from the business centre of Winnipeg to the business centre of St. Boniface. A double street car track will be laid on the route.

Ottawa, Ont.—Notice is given in the Canada Gazette of applications from nine railway companies for legislation at the coming session of Parliament extending the time allowed in existing charter acts for completing lines authorized. The Companies include the Ottawa, Northern, & Western; the Manitoba & North-western; the Dominion Atlantic; the Tillsonburg, Lake Erie & Pacific; the West. Ontario; the Thessalon & Northern; the South Ontario Pacific; the Glengarry & Stormont, and the C. P. R.

Three Rivers, Que. — Hon. Jacques Bureau, M.P., of Three Rivers, will apply to the Legislature for the incorporation of the Three Rivers Traction Co. for the purpose of constructing an electric railway in the city of Thre Rivers, and in a westerly direction to the town of Berthier and easterly to Portneuf, and generally through the whole district of Three Rivers, north of the St. Lawrence river. The incorporators are J. Aldred, Thomas McDougall, Howard Murray, Julian C. Smith, W. S. Hart, of Montreal, and Denis Murphy, of Ottawa.

New Incorporations

La Cie des Chargeurs Beaudry, Ltd., incorporated at Ottawa, capital $49,000, to manufacture wood and metal articles.

The Pierson Gas Producer Plant Co., Ltd., of Montreal, capital, $100,000. Incorporators—P. V. Rougher, A. Decary, A. de Montgaillard, Montreal.

The Goold Engineering and Supply Co. has been incorporated in Manitoba to carry on the business of civil, mechanical and electrical engineers at Winnipeg.

Marine

The Delta Dredging Co., with head office in Vancouver, has been incorporated with a capital of $100,000.

South Vancouver, B.C.—The council has voted $1,000 towards making plans for the improvement of the North Arm, which work will cost the Dominion Government $200,000.

Collingwood, Ont.—The Collingwood Shipbuilding Co. have secured the contract to build a large bulk freighter for the St. Lawrence and Chicago Steam Navigation Co.

Vancouver, B.C. — The Merchants' and Shippers' Steamship Line announces that if a reciprocal trade arrangement is reached between Canada and Australia, as now proposed, it will put on a line of vessels between here and Sydney.

Vancouver, B.C.—The design for a 15-inch hydraulic dredge for use on the Arrow Lakes, submitted by Cartwright, Matheson & Co., Vancouver, has been accepted by the Dominion Government. Tenders will be called soon for its construction.

Winnipeg, Man.— The Hudson Bay Co. announces an expenditure of $20,000 on the development of the far north of Canada in preparation for the great expansion expected when the Hudson Bay Railway is completed in two years. This money will be spent on steel clad steamers on Hudson Bay, and chains of trading posts across Canada.

C.P.R. Steamship Services. — The Canadian Pacific Steamship Lines announced officially on October 24, that T. McNeil, at present Antwerp agent for the company, will succeed to the position of Liverpool agent, left vacant by the death of F. W. Forester. Mr. McNeil has had a lifetime experience in maritime matters, having been employed by the Manchester Line for several years before his connection with the C.P.R. W. D. Grosset, for years Chief Assistant in the general European offices in London, has been selected to fill Mr. McNeil's post at Antwerp.

Contracts Awarded

Brandon, Man.—The Beaver Construction Co. have secured the contract to build street car barns costing $20,000.

Grand Forks, B.C.—A. E. McDougal has been awarded the contract to build a factory here, two storeys, 50x125, for the Grand Forks Canning Co. Machinery is being ordered.

Prince Albert, Sask.—Contracts have have let to Kilmer, Pullen & Burnham, agents, the Swedish General Electric Co., Toronto, for the supply of generators for La Colle Falls water power development.

Vancouver, B.C.—The B.C. Electric Railway Co. has awarded to Campbell Bros., a contracting firm of this city, the contract for the erection of the new passenger station at the south end of the Granville Street bridge.

Thor Iron Works, Ltd., of Toronto, have been awarded the contract for the standpipe at Timmins, Ont., by the Canadian Mining and Finance Co. The standpipe will be 20 feet in diameter and 95 feet high, with a total capacity of 225,000 gallons. Of this capacity, 50,000 gallons will be held as a reserve for fire protection purposes. The standpipe will be erected before the severe weather begins.

Saskatoon, Sask.—The city has awarded a contract to the Canadian Westinghouse Co. for two electrically driven pumps. The pumps will be supplied by the Turbine Equipment Co., Peterkin Bldg., Toronto, who are agents for De Laval pumps and steam turbines. One is a 6,000,000 and the other a 4,000,000 gallon pump, and both will be used for the filtration plant. The Canadian Westinghouse Co. supply the induction motors to run these.

Trade Gossip

Kingston, Ont., is organizing a bureau to secure industries.

The Guarantee Iron Works Co., Winnipeg, recently installed an oxy-acetylene plant.

Lachine bridge, built for the C.P.R. by the late Sir George Reid, of Newfoundland, is for sale.

Whealler & Co., machinists, braziers, etc., are supplying the foundry tools to the Northwestern Brass Co., Calgary.

The Mason & Risch, Ltd., piano makers, have increased their capital from $250,000 to $1,000,000.

Toronto Technical School.—There are 3,137 students registered at Toronto Technical School—660 in the day, and 2,477 at night.

The Manitoba Welding & Mfg. Co., Winnipeg, was the first firm to establish an oxy-acetylene welding plant west of the Great Lakes.

First Cycle Made.—The first motor cycle turned out by the recently organized Brantford Autocycle Co., appeared on the street recently.

Furniture manufacturers have this week been urging the Toronto Board of Control to give them a furniture building at the Toronto Exhibition.

Stocktaking.—The employees of the Waterous Engine Works Co., Brantford, have been enjoying a few holidays while the annual stocktaking took place.

O'Brien, Doughny, Quinlan & Robertson, contractors for section No. 3 of the new Welland Ship Canal, are opening offices on Chappel Street, Thorold, and not in Welland, as we stated last week.

Guelph, Ont.—The separator factory of the Raymond Manufacturing Co., and some of the other departments, are closed down for a week for stocktaking purposes.

The A. R. Williams Machinery Co., Limited, Front Street, Toronto, have moved their supply department and part of their machinery to the new location, across the street, in anticipation of work on the new Union Station and viaduct. The firm is under contract to vacate its building by January 1.

The Moffat-Irving Steel Works, Ltd., held their first general meeting on Thursday last. The following officers were elected:—James B. O'Brien, K.C., president; James W. Moffat, vice-president; T. C. Irving, jun., secretary-treasurer; other directors: W. H. Garvey and John J. Gibson, general manager of the Title & Trust Co.

The Turbine Equipment Co., Peterkin Bldg., Toronto, have been awarded contracts by the Ontario Government for De Laval centrifugal pumps, one with a capacity of 200 Imperial gallons a minute against 230 ft. head for the Hospital for the Insane, Penetang, and another of same capacity against 140 ft. head for the Hospital for the Insane, Orillia.

Nova Scotia Steel & Coal Co.—October was another record month in steel production for the Nova Scotia Steel & Coal Co. The output for the month was as follows:—Coal mined, 75,500 tons; coal shipped, 78,860 tons; iron ore shipped, 85,500 tons; pig iron made, 6,400 tons; steel ingots, 9,580 tons; steel billets rolled, 8,300 tons. The steel production and billets rolled constitute a record.

Housing Scheme for Guelph.—Houses at a reasonable rental are so scarce in Guelph that manufacturers have for some time past been at their wits' end to secure sufficient labor to run their plants. The Finance Committee of the City Council have taken the matter up, and it is likely that a Company will be formed to operate under the Public Utilities Act, whereby the municipality will guarantee their bonds to the extent of 80 per cent. The rate of rental, according to the Act, must not be more than enough to pay six per cent. interest

Information for Inventors. — Pigeon, Pigeon & Davis, patent solicitors of Montreal, report that 182 Canadian Patents were issued for the week ending October 14, 1913, 115 of which were granted to Americans, 25 to Canadians, 23 to Foreign Countries and 19 to residents of England and Colonies. Of the Canadians who received Patents, 12 were residents of Ontario, 5 of Quebec, 3 of British Columbia, 2 of Manitoba, 2 of Alberta, and 1 of Nova Scotia. In the United States, for the same week, 693 Patents were issued, 9 of which were granted to Canadian inventors.

Ashmead Gray Rodgers, for twelve years superintendent of The Carborundum Co.'s plant at Niagara Falls, died October 23, 1913, as the result of injuries sustained through an accident October 5. Mr. Rodgers had a host of friends and acquaintances throughout the mechanical and chemical world. He was a native of Albany, N.Y., having been born there in 1872, and previous to his coming to The Carborundum Co. as superintendent, was superintendent of the Eddy Electrical Co. at Hartford, Conn. His funeral was attended by several hundred of the employes of The Carborundum Co., members of the Niagara Club and other friends. Mr. Rodgers was a member of the American Chemical Society, Engineers' Club and Country Club of Niagara Falls, and several other scientific and social organizations.

Building Notes

Hamilton, Ont.—A by-law to raise $125,000 for city hospital repairs has been passed.

Peterboro, Ont. — The Government may build the new observatory here. There are certain objections to its being built at Ottawa.

Welland, Ont.—The Government has purchased twenty-three acres near the new canal to erect a hospital for the men employed.

Brantford, Ont.—The Building and Grounds Committee have asked Taylor & Bodley to prepare a plan of a city hall, costing $150,000.

Refrigeration

Quebec, Que.—The Quebec Abattoir Co. have been granted tax exemption of ten years by the city. They will go ahead and build now. Hon. J. E. Roberge, president.

Belleville, Ont.—The Belleville Cheese Board has decided to request the Government to assist the Steamship Companies in equipping terminals and steamers with cold storage plants.

Personal

R. B. Angus has retired from the presidency of the Bank of Montreal.

John Rodger Arnoldi, Toronto, mechanical engineer, who died September 12, left an estate valued at $33,829.

H. Wearn, of the Canadian Copper Co., Sudbury, has just returned from Europe, where he inspected several smelting plants.

C. W. Sherman, president of the Dominion Steel Foundries Co., Hamilton, is in the Maritime Provinces on a business trip.

Thomas C. Keefer, C.M.G., of Ottawa, has been elected an honorary life member of the American Society of Civil Engineers.

O. M. Perry, Belleville, has been appointed superintendent of hydro work in Windsor, Ont., at a salary of $150 a month.

J. Orr Callaghan, of the Steel Co. of Canada, was in Fort William last week on business connected with the new mill being erected there.

J. H. Plummer, President of the Dominion Steel and Iron Co., who is in England, visited the Cleveland district, and will also visit Germany.

Robert L. Clarke, electrician employed at the power house, Bobcaygeon, Ont., was the victim of a shooting accident on Tuesday last, while out hunting.

N. B. Wilkes, who has been at the head of the Watrous (Sask.) Electric Light, Power and Traction Co. since the time of its installation, has resigned.

Leonard Miller, B.A.Sc., son of C. J. Miller, of Orillia, has been appointed manager of the electric plant at Watrous, Sask.

H. Pottinger, for fifty years connected with the Intercolonial Railway, and ex-general manager, is now on a visit to Vancouver.

Thomas R. Deacon, president and general manager of the Manitoba Bridge and Iron Works, Ltd., is being urged to become Mayor of Winnipeg for a second year.

John A. Brown, a director of the Forth & Clyde & Sunnyside Iron Co., of Falkirk, Scotland, was in Vancouver last week. He is making a pleasure tour of Canada.

W. A. Bradbury, traveler for the Eagle & Globe Steel Co., Ltd., makers of tool steel, has returned from a Western trip, where he found things much improved in this line.

Charles Margerison has been put in charge of the City of Toronto marine plant. He will start with the building of a $15,000 scow. He was a diver for the city prior to this promotion.

S. H. Reynolds, at one time assistant city engineer of Winnipeg, has been appointed commissioner by the administration board of the Greater Winnipeg Water District.

William Armstrong, for a number of years chief boilermaker of the Michigan Central roundhouse shops, has resigned and accepted a position in the Grand Trunk shops at Bridgeburg, Ont.

Charles D. Winchester, storekeeper of the Canada Car and Foundry Co., New Glasgow, N.S., met with a serious accident on October 29, when a heavy steel girder fell upon him, crushing his leg above the knee.

Alex. Johnston, Deputy Minister of Marine and Fisheries, was married in Quebec City last week to Miss Fields, of Sydney, Cape Breton. Immediately after the ceremony Mr. and Mrs. Johnston sailed for England.

D. W. Clark, of the Canadian B. K. Morton Co., Montreal, is leaving Nov. 11 on an extended business trip. After visiting the Maritime Provinces, Mr. Clark will go on to Newfoundland, and from there he will cross over to England. He will be away about three months.

H. R. Wilkes, manager of the Fort William branch of the Canadian Fairbanks-Morse Co., was married on Wednesday, November 5, to Miss Bessie Smythe, of Toronto. On Monday Mr. Wilkes was presented with a silver tea service by the staff of the Toronto branch.

G. B. Harlock has been appointed manager of the General Supply Co., Adelaide Street W., Toronto, in succession to A. E. Juhler, who has been appointed manager of the Toronto branch of the Rudel-Belnap Machinery Co. Mr. Harlock was formerly manager of the machine tool department of the Ottawa branch of the Dominion Supply Co.

L. C. Randolph is resigning his position as advertising manager with the Canadian Fairbanks-Morse Co. in order to represent the Industrial and Educational Press, Ltd., Montreal, in the United States. Mr. Randolph will be their sole representative in the U.S.A., and will have his headquarters in New York city.

Samuel Terrell, after serving thirty-five years in the plant of the Raymond Manufacturing Co., makers of sewing machines, Guelph, Ont., was the recipient recently of a silver service. He is leaving for Victoria, B.C. For twenty years he has been foreman in the shops. H. L. Walker, superintendent, read an address, and J. R. Rife made the presentation.

Mr. Albert Skinner, who represents some half dozen leading firms of Sheffield, England, has been visiting Toronto and Montreal in the interests of his principals. Among other firms whom he represents are Richard W. Carr & Co., steel, file and tool manufacturers, who make the "Motor" high speed twist drill; Fox Bros., carpenters' braces, engineers' ratchet wrenches, pipe wrenches, parallel vises, etc.; Bennett & Farren, Ltd., power hammers, lathes, shovel rolls, etc.; D. F. Hogan & Co., saws, matchets, sugar cane knives, joiners' and bevel knives, etc. Mr. Skinner's present head quarters are at 491 St. Urbain Street, Montreal.

Obituary

John Allan, proprietor of the Ontario Nut and Bolt factory in Paris, Ont., died at his residence last Saturday, aged 74.

A. G. Rodgers, superintendent of the carborundum plant at Niagara Falls, and formerly of Toronto, died at his home in Buffalo, Oct. 23. The funeral took place in Toronto last Saturday.

Captain Harris, a native of Garden Island, near Kingston, Ont., passed away at his late residence, 40 Ritchie Ave., re-

The Manufacture of Electrically Welded Chain in Canada

By L. B. Powell

Chains, like ropes and belts, fill a large place in the industrial, manufacturing, shipping and commercial world generally, and so far as the necessity of reliability for a definite service is concerned, they come first in importance. The accompanying article deals with a plant and process which have for their object the production of each link joint with an efficiency of 100 per cent. of the solid bar.

IN order that the development which has taken place in the chain industry of Canada during the past few years may be more clearly understood, it will be in order to give a brief description of the manner in which chain is made under the fire-welded process.

The equipment of a chain manufacturing plant under the latter process consists principally of coiling machines, cutting machines, forges and hand or power hammers. The material is coiled into a long spiral and cut into separate links under a cutting press, the spiral being fed into the press in such a way that each link is cut across with a scarf at an angle of about 45 deg. These links are taken to the chain makers and brought to a welding heat in either a combination gas and hand furnace or in a coke forge. A number of links are heated at the same time, and as fast as one comes to a welding heat, it is taken from the fire and the scarfed ends pounded down under the blows of a hand or a power hammer.

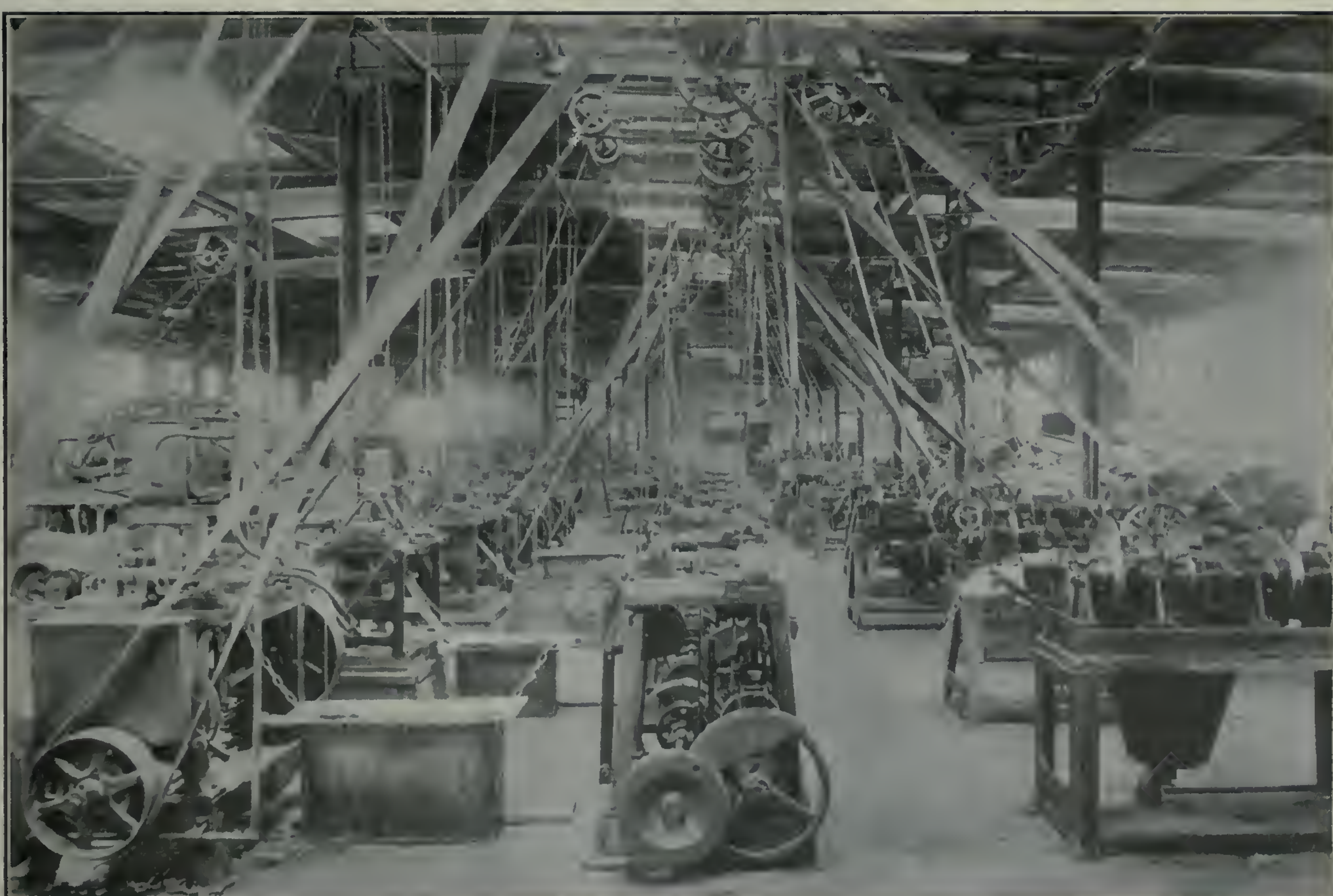
This method of manufacture as regards quality, depends entirely upon the fidelity and skill of the workman, who usually is paid a piece-work price that makes it necessary for him to weld a very large number of links per day. Owing to the rapidity of action required, there is often a large percentage of links either heated too much and thus burnt, or not heated enough so that a perfect weld cannot be made. In addition, there is always the possibility of dirt from the fuel getting between the scarfs of the links, thus preventing a perfect junction of the metal.

Electric Welding a Modern Improvement.

The electric welding of chain is a modern improvement, made necessary by the evils existing under the old style of manufacture. Chain, above all other products, needs the strength that is obtainable only by perfection of welding, and the invention of the automatic welding process is the result of experiments continuing over a long period of time with a view to finding a method of forming and welding links that would result in every weld being absolutely perfect.

The machines illustrated herewith are not the product of a chance thought, but are the result of a long study and expensive experiments resulting in continuous improvements, all of which are fully protected by patents in Canada, Great Britain, United States, and several European countries.

The plant of the McKinnon Chain Co., located at St. Catharines, Ontario, is of modern fireproof construction throughout, and is thoroughly lighted and ventilated. It can be seen at a glance that it is filled with expensive automatic ma-



GENERAL VIEW OF THE McKINNON CHAIN CO. PLANT, ST. CATHARINES, ONT.

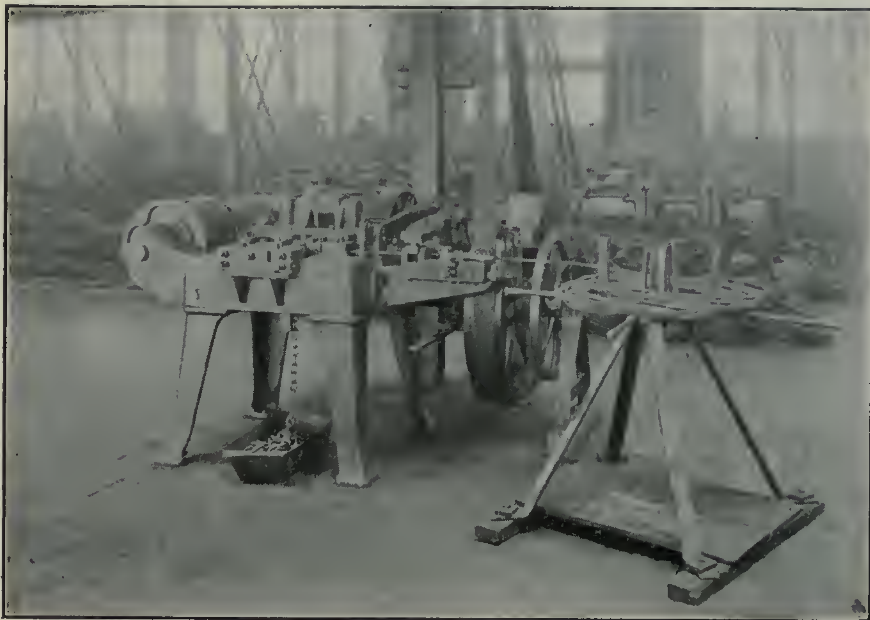
chinery capable of turning out a very heavy tonnage of chain. The company has a similar plant at Buffalo, N.Y., for its United States business.

Manufacture of Butt-Weld Chain.

The first operation in the manufacture of butt weld chain is that of bringing the chain into unwelded links on the forming machine shown herewith. The coils of wire are fed into the machine from a spool, and the operation of the machine is entirely automatic, linking the chain together ready for welding as shown. From the forming machine, the unwelded chain is fed directly into welders of the type illustrated, the operation of which is also entirely automatic.

Owing to the fact that alternate links present themselves for welding with the opening at different angles, these welders are constructed with two heads, so that the first head will weld every other link, and the second head will weld those in between; the chain being twisted between the first and second heads so that the link will be presented to the jaws of the welder in the same position. This arrangement is one of the Patented features of these machines.

The electrodes of the welder meet the material on each side of the joint, and, while the current is passing across the joint, the link is being given compression at the ends so that a junction of the material at the welding heat is being effected. The heat is developed by the passing of a large volume of current at a very low pressure, 2 to 3 volts. The pressure is so low that the current cannot be felt even with both hands on the electrodes, while the volume is so great that ½-in. links come to a welding heat in 5 seconds, and it requires a conductor or lead 8 inches square of pure copper. A curious fact about copper used for such purpose is that one per cent. of impurity reduces its current carrying capacity by 33 per cent.



CHAIN FORMING MACHINE.

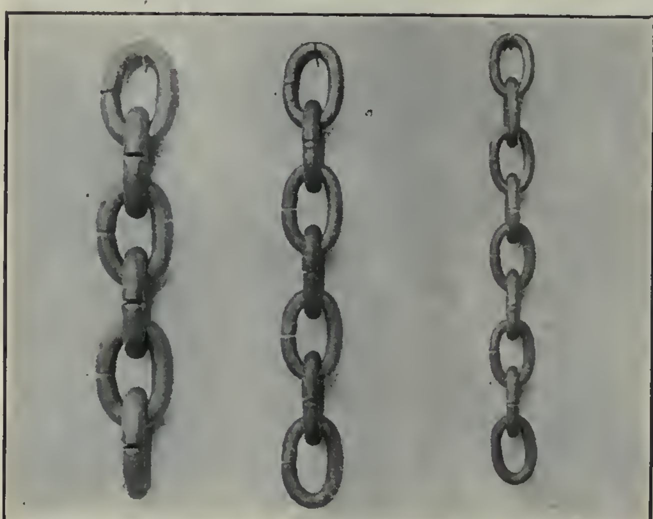
These welders are entirely automatic, with the pressure and current regulated so that each link receives exactly the correct amount to insure a perfect weld. This does away with the uncertainty of fire welding, where the perfection of the weld is subject to the chances of want of skill or care on the part of the workman, burning or insufficiently heating the steel, and of dirt or sulphur in the fuel.

One of the illustrations shows several sizes of chain just as they come from the welder and indicates clearly the swell at the weld which is a feature of all McKinnon products. This swell is a natural result of the process of manufacture, and while it could be reduced so that the weld would be equal in diameter to the balance of the link, such a reduction would not only take away the extra strength where most needed, but would have a tendency to weaken the weld mechanically, and, in both ways, would reduce the quality of the product.

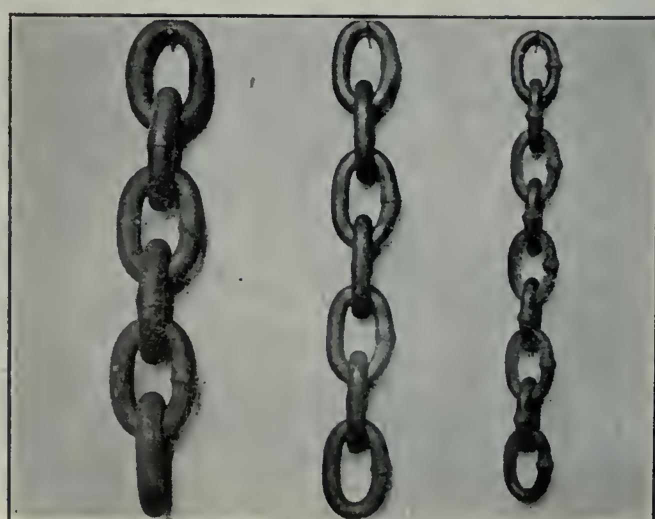
The swell at the weld does not interfere in any way with the use of the chain for practically all purposes, and a great many tests have proven absolutely that the reduction of the weld would mean a decrease of almost 50 per cent. in the strength and wearing quality of the chain.

Test Features.

While records show that over 99 per cent. of the product of these automatic welders is perfect in quality of welding, yet nothing is omitted that will produce as near to 100 per cent. perfection as possible. For that reason, every link of chain is carefully inspected after it leaves the welder, and any links that show evidence of imperfect welding are at once cut out, and the chain passed to the hand welder to be joined together before being tested. In the manufacture of electrically welded chain, because the pressure and current are regulated automatically, nothing is left to chance or to the skill of the workman.



CHAIN FROM FORMING MACHINE READY FOR WELDING



ELECTRICALLY WELDED CHAIN SHOWING SWELL WELD.

FACTORY AND WORKSHOP FLOORS.

TO get good results from labor of any kind it is necessary, says "The Ironmonger," that the surroundings should be fit for the class of work carried on, and, as free movement is necessary with all classes of work, the condition of the floors of every workshop is important. To be level, and free from liability to slip are both essential conditions, although the same kind of material cannot be used in all cases. Thus, in an engine-room tiled floors can be used effectively, because they may be kept clean; and as the men employed round the engines do not wear slippery footgear they would not be inconvenienced by them. On the other hand, the same tiles in an oil mill would be troublesome for men to move about on; while in a forge they would soon break up, and the resulting uneven surface would cause trouble.

AUTOMATIC CHAIN WELDER.

Main Floor Materials.

For most floors in manufacturing works, considerable strength should be provided, and usually a good foundation is necessary. Concrete mostly forms as good and cheap a foundation as can be provided, and if made of good materials is hard to beat for strength, particularly if reinforced with expanded steel lathing, as this gives a greatly increased tensile resistance. Strong and continued percussive vibration soon causes concrete to disintegrate, however, and, where this is encountered, clay puddle would stand better; while with proper care it could be faced with bricks or wood blocks with perfect safety. Bricks of a non-slippery character, however, would be preferable, owing to the desirability of keeping the clay puddle moist.

For ordinary engineering workshops, wood blocks on end, if laid on a concrete foundation, give the best results, and if jarrah or other hardwood is used, the floor would last almost indefinitely. At the same time, where cheapness is a matter of primary importance, deal blocks last a reasonable time, but they soon wear lumpy under traffic, and will not resist blows so well as the jarrah. A good deal, of course, depends on laying the surface level, while as far as possible the hardest blocks should be picked out and placed where there is most traffic.

Block floors should be from 4 to 6 in. thick as a rule and the blocks should be well grouted together with hot tar or similar material, with sand plentifully worked in on top. Cement grouting is unsatisfactory, as not only is it inelastic, but it also forms unpleasant ridges when the surface of the blocks wears down. Good sound bricks set on edge make satisfactory floors when there is not much percussion and banging about on them; but they are undesirable if they have a slippery surface, as men may slip and meet with accidents. Boarded floors need no remark beyond noting that they should be stiff enough to carry any weight that the exigencies of the particular trade may impose on them. Concrete floors with or without reinforcement (but preferably with), if made with a shingle facing, are a nuisance in any workshop, but with finely broken sandstone, or even with a crushed-granite facing, concrete makes a good floor, especially for wet work; but it should not be subjected to much hammering.

Smithy floors are usually best when made of puddled clay or marl of a good thickness, as this is tough and does not break up freely. Of course, a certain amount of dampness is necessary, and for this reason only the working floor should be of puddle, the stock and storage part being floored with concrete, bricks, or wood blocks, the latter, of course, not being subjected to heat. With proper precautions as to fixing anvil blocks and foundations, a brick floor may be used with some classes of forge work; but there must be no chance of the floor being slippery with this kind of work.

Foundry floors, where not used as moulding floors, may very well be of clay puddle free from stones and carrying a thin layer of old sand, as the

CHAIN IN STOCK.

splashing of molten metal when spilled on concrete or stone flooring is liable to cause injury. In some parts of the foundry, where the molten metal does not reach, concrete makes a good floor, and so do bricks; but, anywhere else, simply sand or clay puddle sanded over should be used, so that the danger referred to may be minimized. Wood or other combustible material is simply unthinkable in this connection.

Upper Floor Materials.

Where there are upper floors used as workshops the flooring must depend on the character of the work done and the live weight to be carried, for which reason timber or reinforced concrete can be used alone or in combination as the necessities of the case may require. Where there is a lot of hammering and other percussive work, concrete is liable to become disintegrated, and for this reason it is rather an open question whether it is not the better plan to have a thick floor of Lombardy poplar tongued with metal or wood, which would be practically fireproof. Reinforced concrete put together with expanded metal lathing will stand a good many strains short of percussion, but this does not fit it for everything.

Metal floors on metal girders would give good general results but for the reason that provision has to be made for contraction and expansion, such as special treatment of the walls or other bearing points. Where iron or steel floors are used the girders should be on rollers at each point of support; ends passing into walls should be enclosed in boxes, and have space to expand, because, in the case of fire, the walls would be pushed out. Rolled steel plates with chequered surfaces should be in countersunk slots to prevent the plates buckling.

Metal floors are far too slippery to be strongly recommended, however, as workmen having boots with hobnails or steel points in them experience difficulty in maintaining their foothold.

STERN WHEEL TUG MACHINERY.

THE Polsons Iron Works recently shipped to Hudson Bay a stern wheel tug which they built at their works in Toronto. The tug was built for the Dominion Government for service at Port Nelson. A description was given of the tug in the July issue of Marine Engineering, and we now give particulars of the main engines and auxiliary equipment.

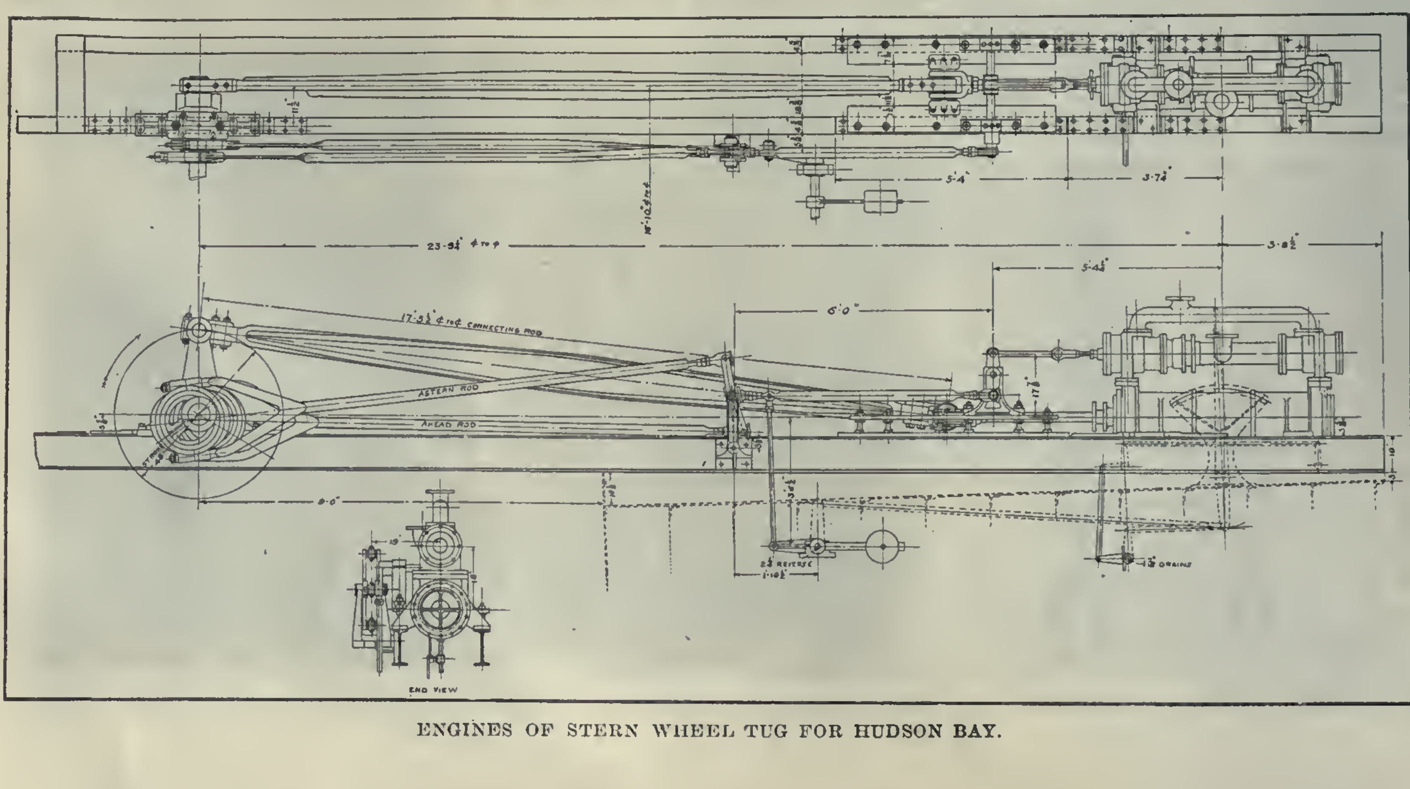
Main Engines.

The main engines consist of one pair, port and starboard, and are identically the same design and dimensions, except that they are right and left-handed. They are of horizontal, single cylinder type, located in the stern of the tug, and are connected to the wheel shaft by long connecting rods. The wheel shaft serves as the crank shaft, and is fitted with a crank at each end, set at 90 degrees. The eccentrics are, of course, fitted on this shaft and inside the cranks. The crank or wheel shaft is 6 7-16 in. diameter and is made of mild steel. The stern wheel is 15 feet diameter overall, and has 13 wooden buckets, each 10 ft. long by 14 in. wide. The wheel is carried by 2-I beams set at an angle and extending out over the stern and supported by out-board brackets.. The cylinders are secured to the in-board ends of these I beams which serve as a frame for the engines. The engines develop a total of 250 horse power at 28 r.p.m.

The accompanying illustration gives an idea of the general design. The cylinders of both engines are 12 in. diam. by 48in. stroke. The valve gear is of the double eccentric link motion type, and is connected to the eccentrics by rods made of extra heavy wrought iron pipe fitted with suitable connections to the eccentric straps and links. The lever for controlling the valve gear is conveniently located near the cylinders and operates both sets of motion simultaneously. The connecting rods are exceptionally long being 12 ft. centres. They are of special construction in order to reduce the weight as much as possible. Each rod has 2 steel straps with a wood filler between and securely bolted. The connections between the straps and crank and crosshead ends are of special design.

Auxiliaries.

A locomotive type boiler 56 in. diam., by 20 feet long and carrying a steam pressure of 160 lbs. per sq. in., is located forward of the engines. It supplies steam for the main engines and auxiliaries. A No. 12 "National" feed water heater is installed in connection with the boiler. Electric light is furnished by a vertical steam engine driving a $3\frac{1}{2}$ k.w. generator. This set was supplied by the Enberg Electricity & Machine Works, St. Joseph, Mich. Two outside packed duplex pumps $5\frac{1}{4}$ x 3 x 6 in. are installed for boiler feeding and general service, and were supplied by the Smart Turner Co., Hamilton, Ont. On the deck are installed two double barrel type capstans equipped with 6 x 8 in. double cylinder reversing engines, supplied by tht American Ship Windlass Co., Cleveland, Ohio.



ENGINES OF STERN WHEEL TUG FOR HUDSON BAY.

"Leonard" Locomotive and Car Shops of the N. T. R. at Quebec

No more effective expression of confidence in the future development of the Dominion of Canada and its progress towards a place in the forefront of the world's commerce need be sought beyond the fact that, at chosen points from coast to coast, are being located by our great railroad corporations, locomotive and car repair shops whose layout and equipment makes provision for the inevitable demand which, in a few years more, will assert itself. This preliminary sketch covering the National Transcontinental shops at Quebec, has a live interest for subscriber and advertiser alike.

THE general layout of the repair shops of the National Transcontinental Railway at Quebec, P.Q., shows that not only has convenience of operation been the general principle governing the design, but future needs have also been provided for. Each shop is capable of extension without interfering with any other, and each department can be increased independently as occasion may require.

There are eleven buildings in all, of various dimensions, each suitable for the special work to be done in them. These buildings consist of a locomotive erecting, machine and boiler shop, under one roof; forge shop, freight car shop, stores building, power house, planing mill, dry kiln, lumber shed, forge stores and scrap bins, oil house, and office building for the the executive staff. The total area covered is about five and one-half acres.

The Erecting Shop.

In the erecting shop there are eighteen pits, placed tranversely, over which a 120-ton crane lifts locomotives into and removes them from their respective positions. A 20-ton crane, operates over the same area at a few feet lower level, and carries small material and makes light and rapid lifts.

The "transverse-pit layout" has the advantage of doing away with many side doors in the building for the "in-and-out" movement of locomotives. There are two doors, conveniently placed, through which engines and material enter and leave. This arrangement is economical in the matter of heating. It does away with the necessity of a transfer-table with all its inconvenience from snow and ice. The practically unbroken sidewall permits the use of jib cranes, one serving the fronts of two locomotives, and capable of lifting smoke stacks, main valves, smoke box doors, rings, etc. The use of these very handy cranes would be most difficult if the wall of the shop had been cut up into a series of doors.

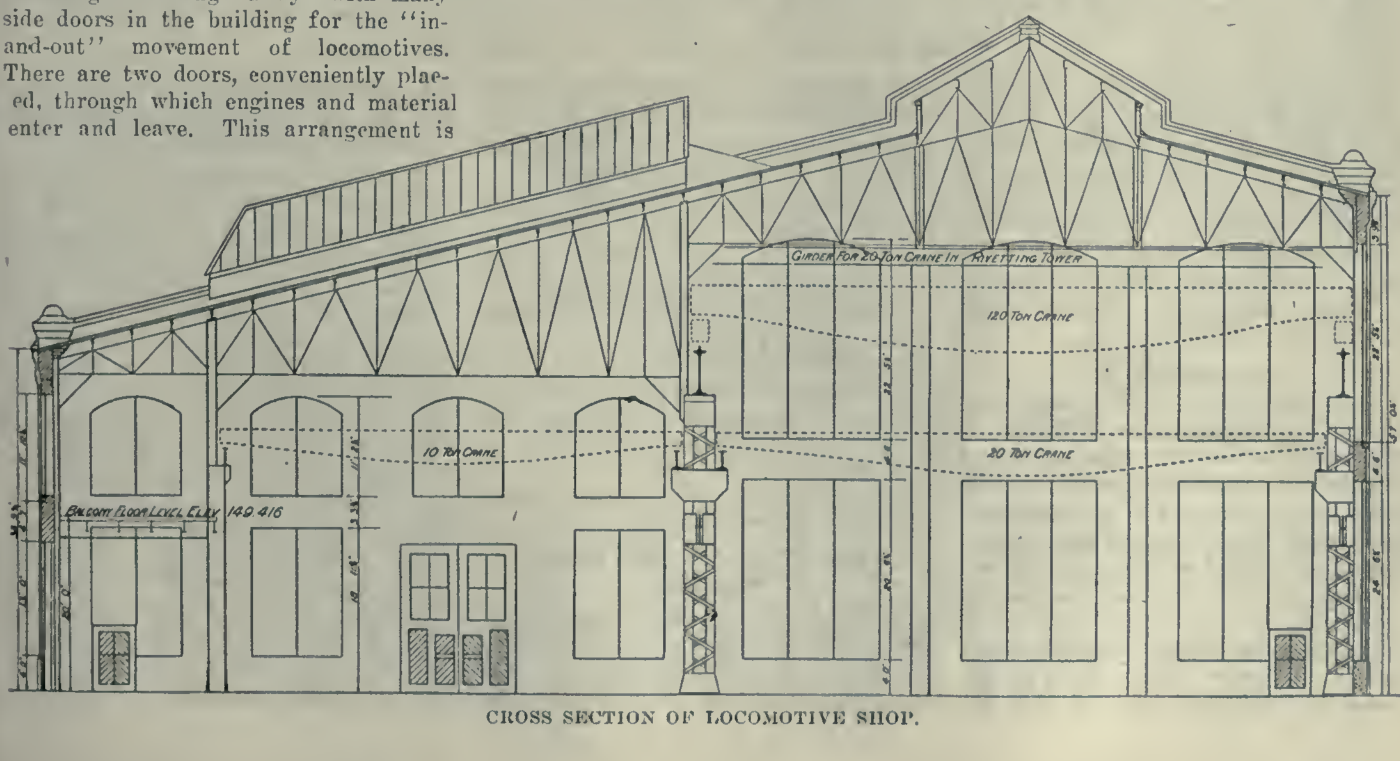
The Crane Feature.

The cross-section of the shop shows the position of the cranes. The large crane is carried on a series of built-up columns, so that, the heavy load is central over the line of foundations. As one crane does the work of lifting and placing each locomotive, there is no chance of confusion such as might occur when two cranes are used, and where two men do the work. The single powerful crane has also the advantage over the usual twin crane arrangement in economy of first cost and maintenance.

All the overhead cranes are provided with effective safety appliances. One of the most important, prevents the load from being "over-wound" by the lifting drum, either by accident or otherwise. It consists of a device which, when the maximum lift has been reached, automatically opens a switch on the hoisting circuit and so cuts off the current, thus suddenly removing the driving power. The cessation of the current immediately brings into powerful action a gravity operated brake which is normally held out of service by the flow of current.

Midway Crane Arrangement.

The direction in which the midway crane operates is a new departure in railway shop construction, which has been brought out by Mr. W. J. Press, mechanical engineer of the commission. It secures substantial advantages. The midway is laid out so as to be alongside of the shops, and not at the ends of the buildings as is frequently the case. The object of this arrangement is that when material is brought by the midway crane from the storehouse, forge shop, or foundry to the machine, erecting or boiler shop, it is placed at the door nearest to the machine on which the material will be handled, or to the engine upon which it will be used. In this way, the delivery of material is not concentrated at one spot at the extreme end of the building. It avoids distribution from a congested area, and it obviates the "long haul" through the shop. Material is laid down at a point as near as possible to its destination, and economy



CROSS SECTION OF LOCOMOTIVE SHOP.

of time and labor, as well as facility in handling is thus secured.

The system of placing machines is such that the movement of material will be in one direction and the distance over which any locomotive "part" is carried, will not be unnecessarily lengthened by journeys forward from one machine and back to another. The continuous one-way movement of material saves time and labor and prevents interference.

The pits in the locomotive shops are supplied with steam, compressed air, hot and cold water. Depressions in the pit walls carry the pipes. By this arrangement, the working space in the pits is not restricted, and the pipes are not where they can be easily damaged by workmen dropping material on them; and, thus, while being quite safe, they are out of the way.

Forge and Boiler Shop.

The forge shop and the boiler shop are placed as near as possible to the power house. This is important, for in the case of the forge shop, where hammers are operated by live steam, the short distance between boiler and hammer reduces condensation and delivers steam where it is required with small loss. A similar condition holds good in a sense, for the delivery of compressed air to the boiler shop machinery. The nearer the source of supply, the less the pipe friction involved and the smaller the losses due to the forcing of air through the pipes.

General.

Industrial tracks form convenient means of communication between the various shops and the buildings, cars, engines and supplies are protected by a water-system arranged to be readily put into use in case of fire. A further protection is afforded by reason of the use of concrete and steel in the various structures.

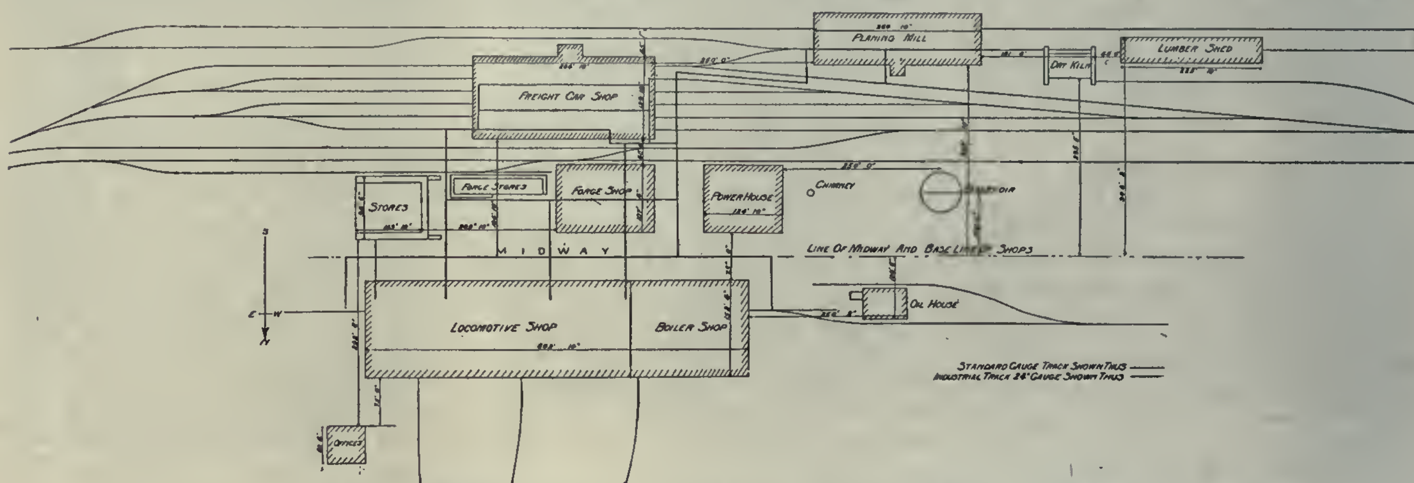
The shops are situated at Quebec, and have been named after Major R. W. Leonard, chairman of the National Transcontinental Railway Commission, under whose administration they were projected. The outlay has been carefully supervised so that excellent results will be attained and full value received for the money expended.

The whole plant has been laid out under the supervision of Mr. Gordon Grant, chief engineer, in such a way that the latest and most modern railway practice has been provided for, the design being second to none in the country.

The permanent and substantial character of the shops and the size of the whole plant will be of material advantage to the city of Quebec, by providing steady employment for a considerable number of men the year round. The contract for the buildings has been awarded to Mr. Joseph Gosselin, of Pt. Levis, Quebec.

The design and laying out of the plant, the relative size, arrangement and position of the buildings and the selection of the machinery and appliances have been entrusted to Mr. W. J. Press, mechanical engineer of the commission who had charge of similar work at the Transcona shops of the National Transcontinental Railway near Winnipeg. The latter are now being operated.

In general plan and in kind and quality of equipment they are of the most up-to-date type. The Transcona and the "Leonard" shops, when completed, will embody such design and practice, as will enable them to be operated with a very high degree of efficiency. Altogether they will form a most valuable addition to the second of the great National "cross-continent" highways of Canada.



LAYOUT OF THE "LEONARD" LOCOMOTIVE AND CAR SHOPS AT QUEBEC.

NEW C.P.R. ST. LAWRENCE BRIDGE.

ONE of the greatest undertakings which the Canadian Pacific Railway Co. have had in hand during the past three years has been the reconstruction of the St. Lawrence bridge over the river St. Lawrence between Highlands Station and Caughnawaga. This remarkable engineering job was completed on Tuesday, October 28, when Mr. David McNicoll, vice-president of the C.P.R., tightened up the last bolt in the track and officially opened this double track bridge to general traffic. The interesting ceremony was performed in the teeth of a strong wind blowing at the rate of between thirty and forty miles an hour.

Those present included, in addition to Mr. McNicoll, Mr. Phelps Johnson, general manager of the Dominion Bridge Co.; G. H. Duggan, chief engineer of the Dominion Bridge Co.; A. D. MacTier, general manager, the C.P.R. Eastern lines; P. B. Motley, engineer of bridges, the C.P.R.; H. H. Vaughan, assistant to the vice-president of the C.P.R.; J. M. R. Fairbairn, chief engineer of the C. P.R.; J. K. McNeillie, superintendent of Montreal terminals; F. W. Cowie, chief engineer, the Montreal Harbor Commissioners; M. S. B. Brown, engineer of the C.N.R. tunnel; C. N. Monsarrat, chairman of the Quebec Bridge Commission; and Mr. George Hodge, superintendent of the Eastern lines of the C.P.R.

The party left Windsor street station by a special train and on arrival at Highlands picked up the representatives of the Dominion Bridge Co., afterwards proceeding to the bridge which was inspected, and the last bolt put into a rail joint by Mr. McNicoll. A silver nut and bolt had been prepared by the engineers for the purpose and after the camera man had taken a picture of the interesting group, Mr. McNicholl gave the nut a last turn and the bridge was completed. The train then conveyed the party to the Caughnawaga end of the structure which was also inspected. The party subsequently returned to Windsor station, after which an adjournment was made to the Mount Royal Club where luncheon was served over which Mr. Phelps Johnson presided.

Before the party separated Mr. Johnson said that they had completed that day what had been undreamt of twenty-five years ago, and the work was a credit to all who had been connected with it.

Bridge Statistics.

Mr. P. B. Motley, the engineer of bridges for the C.P.R., gave a few interesting statistics with respect to the erection of the bridge. He said that it had taken three years to build. There were really two bridges, each of single track, and, by well considered methods, the structure was erected in sections, traffic being shifted from up-stream to down-stream until the whole was finished right across the river.

In June, 1910, the steel and masonry was going up together, and the first half of the bridge was completed between June 1910 and March 1912. Last spring after desultory work during the winter, the old spans that remained were taken down, and the last of the channel spans installed.

As far as speed is concerned, between April 21 and October 21 this year, the last five old spans—two 270 feet, two 408 feet and one 120 feet—were taken out and five new spans of similar length erected. This work was accomplished in six months which is understood to be a record for the moving of 4,000 tons of steel with traffic passing all the time. In connection with the work of building the bridge, there were 3,500,000 rivets used. It was interesting to know also that only two men had lost their lives during the great undertaking. One fell off a scow into the river and could not swim, and another man fell off a locomotive derrick in the yard. Mr. Motley complimented the Caughnawaga men on the part they had taken in the work. The bridge is five-eighths of a mile in length as against that of the Victoria bridge of two miles and a half.

The floating in of the third and fourth channel spans had been acomplished in record time. The third took 22½ minutes actual time, while the fourth had been placed into position in 15 minutes, which was certainly a remarkable achievement. He congratulated the Dominion Bridge Co. on their excellent work. It required 3,450 cars to handle the material.

The bridge is now in full operation and greatly assists the operation of traffic in and out of the Montreal terminals.

TIGHTENING THE LAST NUT ON THE NEW C.P.R. BRIDGE OVER THE ST. LAWRENCE.

RAPID METHOD OF COLORING DRAWINGS.

EVERY draftsman has occasion at one time or another to color a drawing or a whiteprint. The use of colored inks is unsatisfactory; cross-hatching in colors obscures the details and is slow, while water colors have the disadvantage of slowness besides being difficult to apply evenly.

A quick and satisfactory method of coloring involves the use of ordinary wax crayons and gasoline, says the Engineering and Mining Journal. Crayon of the color desired is applied and then rubbed with a piece of cloth, wet with gasoline, until the color is even, and extended to the limits desired. If it overruns the lines, it can be erased with a pencil eraser.

Some colors, particularly the yellows, purples, greens and light blues, produce much better results than others. It is probable that the gasoline dissolves the wax from the crayon, leaving the pigment as an impalpable powder, which, when rubbed over the paper, colors it uniformly. The method is applicable with equal success to egg-shell and smooth drawing papers and to white prints on both paper and cloth.

Personal

C. S. Wilcox, president of the Steel Company of Canada, has been staying at Hot Springs, Va.

H. H. Powell, manager of the Brantford Gas Co., has resigned. He is succeeded in Brantford by H. Stringer.

William Crawford has been elected secretary of the Alberta Rolling Mills Co., Medicine Hat, Alta., in place of A. L. Scott.

A. C. D. Blanchard, formerly city engineer of Lethbridge, Alta, has been appointed to the engineering staff of the Greater Winnipeg Water District.

N. A. Yarrow, of Yarrow's, shipbuilders, Glasgow, was in Vancouver last week on a pleasure visit. He denied the report that his company would build there.

A. E. Hanna, manager of the Winnipeg branch of the Steel Co. of Canada, was in Montreal during the past week. Mr. Hanna has been spending a vacation

J. K. L. Ross has been elected a director of the Canadian General Electric Co. to fill the vacancy created by the death of his father, the late James Ross.

A. Leo Mieville, until recently the Canadian representative of W. H. Allen, Son & Co., Ltd., Bedford, Eng., has joined the staff of Smith, Kerry and Chace, consulting engineers, Toronto, and has gone west on business.

Obituary

John Milne, Burk's Falls, Ont., who has built many saw mills and sash and door factories in Ontario, died Oct. 22. Building

Louis Bartholomew, who established the first foundry in Orillia, Ont., died on Thursday, October 30, at Montreal. He started his foundry in 1870, later selling it to Vantassel & Newton, who sold it to Tutton's.

AMBULANCE BRIGADE IN A CANANDIAN MANUFACTURING PLANT.

By S. Holland.

IT is a well known law of physics that great bodies move slowly, and such is the case with the St. John Ambulance Association work in Canada. This great philanthropic movement is well known in the British Isles.

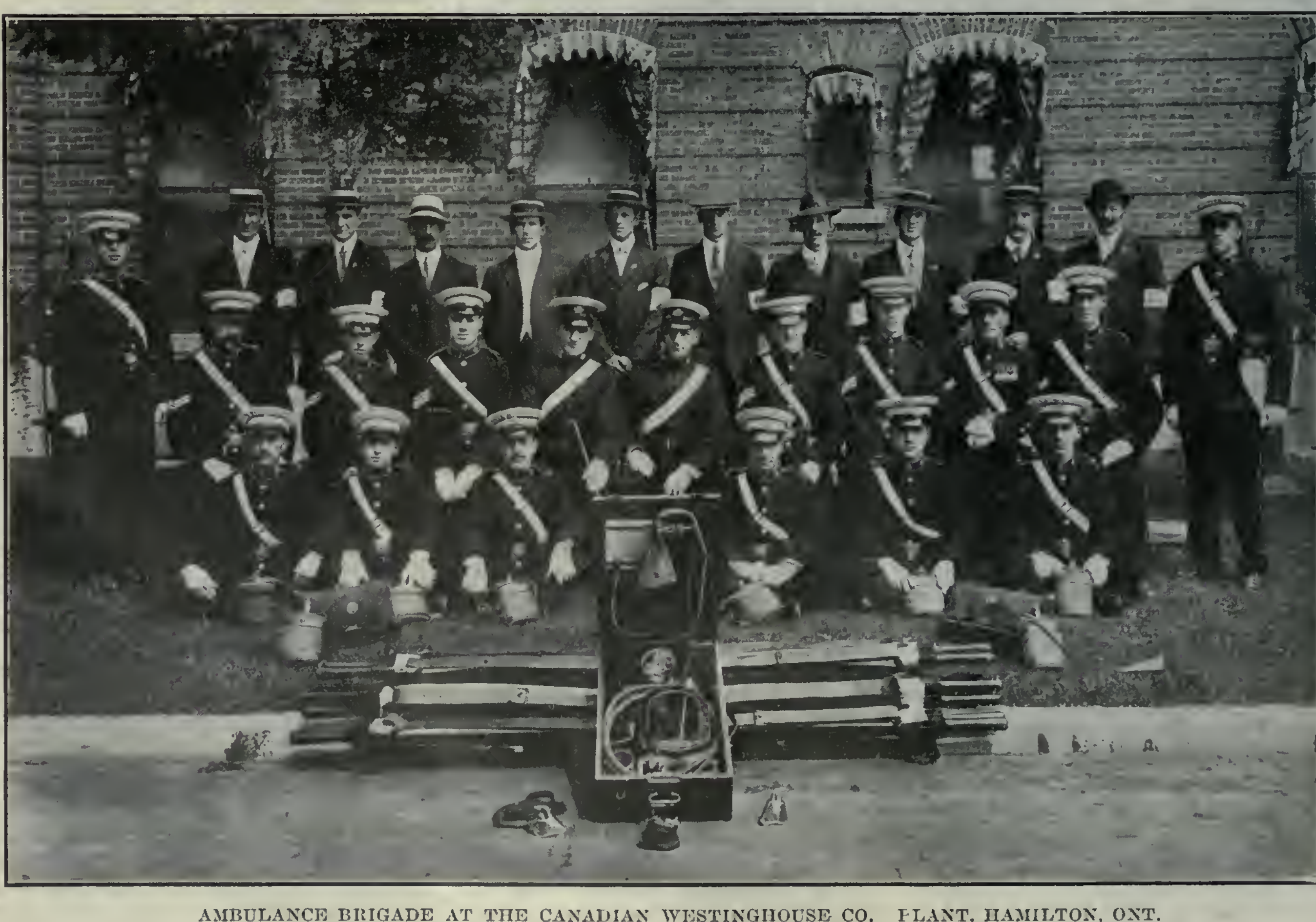
Being a British institution, it naturally expanded slowly in other parts of the British Empire, but judging from the progress being made in Canada, its permanency here is assured. The manufacturer, railroads, police departments, stores are recognizing the value of "first aid to the injured," and are encouraging their employes to qualify themselves in same.

According to statistics from the Labor Department of Canada covering the years 1904 to 1910, there are, annually, 2,000 workmen killed, and 10,000, whose industrial efficiency is impaired for all time, while in the course of their employment. This does not cover the thousands of accidents which happen in the home, on the street, and those of the pleasure party. Figures of this kind are of an appalling nature, and mean a great loss annually to this young and rapidly growing nation, and are sufficient argument, why the St. John Ambulance Association work should be encouraged in every way.

Classes in "first aid" have been carried on in many places, and men have qualified themselves for this work. In many instances, lectures have been given gratuitously by the medical profession, and the members of the classes have not had to buy their own equipment. The latter is one reason why the work has been hampered, and in addition, some firms have looked on indifferently at the efforts of their employees to obtain a knowledge of "first aid," little thinking of the value of these employes over those who have not the knowledge. The lack of encouragement by employers is a great hindrance to the work, and decidedly detrimental to themselves.

Another branch of "first aid" is the St. John Ambulance Brigade, which is the organization of these men who are qualified in "first aid," into companies, to render practical assistance to the public on the street, or their fellow employes in the shop. Col. Sir H. M. Pellatt, is the deputy commissioner of the Brigade for Canada, and Capt. G. R. N. Collins has been, and is at the present time traveling from place to place, giving illustrated lectures on the aims and objects of the association. One of the first divisions of the Brigade to be organized was in connection with the works of the Canadian Westinghouse Co. of Hamilton. This division consists of 45 men who have given a great deal of time and study to the work, many of its members not only holding "first aid" certificates, but also having qualified in home nursing, hygiene and military sanitation. These men not only qualify but must stand a yearly re-examination to prove beyond all doubt that they are capable of rendering such assistance as may be necessary to any sick or injured person.

The members of the division are distributed throughout the large plant of the Canadian Westinghouse Company, so that, whenever an accident occurs, a skilled man is within hailing distance, and the injured person is removed to a large room in the works, which is equipped with stretchers, lockers filled with dressings, a pulmotor and all the different articles necessary for the work, and where an efficient "first aid" man is in charge. If deemed necessary, the injured employe is handed over to the works surgeon for further treatment. It is a standing rule that any employe receiving a minor injury such as a small cut or abrasion must report at once to the "first aid" department and have his injuries cared for. While this is not a military body, its members are uniformed, and have to undergo certain military



AMBULANCE BRIGADE AT THE CANADIAN WESTINGHOUSE CO. PLANT, HAMILTON, ONT.

training for the purpose of promoting discipline and uniformity of movement, this being necessary in removing patients by stretcher and when mobilized for public duty.

Besides being of service to the company, the division do public duty at skating rinks, football matches and other large gatherings, and during the recent Centennial Celebration, they were of great assistance to the public.

This division, since its organization, October, 1912, has to its credit some 390 cases, which have been cared for on public occasions. For the furtherance of the work, a class of instruction is held each year, when a full course of lectures is given for persons desirous of taking the course. This class started three years ago. during which time 300 persons have received certificates. The work is done free of charge by the members of the brigade.

It has been demonstrated, from the experience of a large number of Canadian firms, that the protection afforded the employer by having classes of employes trained in "first aid," fully compensates him for the small expense attached to such an institution, and since it is a well-known fact, that a dressing properly applied immediately after the accident, materially reduces the period during which the injured person is unable to perform his duties, it is to the interest of every employer of labor to not only train his employes, but in addition, to have a "first aid" outfit on the plant to meet all emergencies.

REPORT ON BOILER EXPLOSION AT COLLINGWOOD, ONT.

T. J. MAIN, Provincial Boiler Inspector, in his report to D. M. Medcalf, Chief Boiler Inspector, Province of Ontario, says:

On September 25th, by your instructions, I proceeded to Collingwood, Ont., to inspect a boiler built by the Sawyer Massey Co., and owned by Blackstock Bros., and situated at their farm about two and a half miles from Collingwood. Blackstock Bros. were endeavoring to sell the boiler and engine to Schell Bros., and were running a test with the steam gauge standing at 80 lbs. per square inch and with 3 inches of water showing in the glass when the boiler exploded, killing Edward Blackstock, while his brother, Neil, received very serious injuries. The Schell Bros. were not seriously hurt.

Boiler Features.

The outfit is known as a threshing engine and boiler mounted on wheels. The boiler is 28 in. diameter, and contains 36 tubes 2 in. diameter by 70 in. long. The shell is 3-16 in. plate; the heads, wagon top and furnace 1/4 in. plate; the front head and furnace tube sheet 5-16 in. and the foundation ring of cast iron 2 in. by 2 in., and flange 1 in. by 1/2 in. The furnace was 23 1/2 in. by 32 in. inside. The boiler was made of steel throughout; the riveting of longt. seams 5/8 in. rivets by 2 1/4 in. pitch; circum. seams 5/8 in. rivets by 1 7/8 in. pitch. The screw stays were 3/4 in. diameter by 12 threads per inch.

All parts of the furnace and crown sheets were in fair condition. The shell of boiler was made in two courses, and the rupture started on the front end of the centre course just below the longt. seam. The longt. seams are about ten inches below the centre line of boiler, and the lap joints look down. They are made that way so that when the machine is out in the weather the rain or water will run off without laying on and corroding the seams.

It would appear that the caulking on this seam had been defective, and leaked slightly for some time, as the shell plate at this point had corroded until it was only .047 or 3-64 in. thick at the front end of this seam. At the other end of this seam, the thickness is .104, plainly showing that the seam had been leaking the whole length. When the longt. seam let go, the force of the explosion was downward, the second course shearing off at the line of the first course, just back of the riveted seam. The boiler and engine then scattered over a radius of 100 feet.

The safety valve was free and appeared in good working order. There was no slope to the water gauge. The injector (Penberthy) is practically new. They were carrying 80 lbs. pressure per square inch when the explosion occurred. When they had stopped using the boiler about one year ago, they had been carrying 120 lbs. pressure. At its best, when new, according to our regulations, it was never good for more than 100 lbs. pressure:

$$\frac{2 \times .1875 \times 60000 \times .69}{28 \times 5.5} = 100 \text{ lbs. W.P.}$$

and when the boiler explosion took place it was not good for more than 25 lbs. W.P.

$$B\ \frac{2 \times .047 \times 60000 \times .69}{28 \times 5.5} = 25 \text{ lbs. W.P.}$$

The place where the rupture took place was easy of access, and if the boiler had been under inspection, the corrosion could easily have been detected, an explosion prevented, and lives saved; in fact, boilers of this class, with such light plate, could not be allowed under present Regulations.

When it is realized that boilers of this class do not come under the present Regulations, and that manufacturers of this class of boiler are still building them of the same material, and further, that there are hundreds of these boilers in Ontario in no better condition than the one that exploded, and that it is not by any good management of the owners that they hold together, then something ought to be done to save the people from themselves.

POWER DEVELOPMENTS NEAR MONTREAL.

HYDRO-ELECTRIC development in the Montreal district has made rapid strides of late, and is on a scale that anticipates a large demand for power in the near future. The Laurentide Company's new plant, which is expected to be completed next spring, will increase the development at Grand Mere to 80,000 horse-power, which capacity can be further brought up to 100,000 horse-power at comparatively low cost. A considerable portion of this power will be available for purposes outside of those of the company. The present development at Grand Mere is 22,000 horse power.

The Cedar Rapids plant, with an initial capacity of 100,000 h.p., and 160,000 aimed at ultimately, will, according to the latest reports, be ready by the autumn of 1914, according to the original plans.

With both the Cedars and the new Laurentide plants in operation, and the extensions carried out at Shawinigan this summer completed, the hydro-electric development in the district of which Montreal is the centre should be upwards of 400,000 horse-power by the end of 1914. This is exclusive of the plans of the National Hydro-Electric Co. at Carillon, of which comparatively little has been heard recently, but which aim at a development of 160,000 h.p. The Montreal Light, Heat and Power Company's water powers at Chambly, Soulanges and Lachine, the Canadian Light & Power's plant at St. Timothee and smaller plants account for 100,000 horse-power in addition to the foregoing.

The following table gives the total development in horse power of hydro-electric plants in and around Montreal, which should be available by the end of 1914, together with the announced extensions in view:

	Dec., 1914.	Planned
Shawinigan	140,000	....
Do. hydraulic ...	45,000	....
Cedars	100,000	160,000
Soulanges	15,000	....
Chambly	20,000	....
Lachine	12,000	....
Laurentide	80,000	100,000
Can. L. & P.	30,000	....
National H.-E.	....	160,000

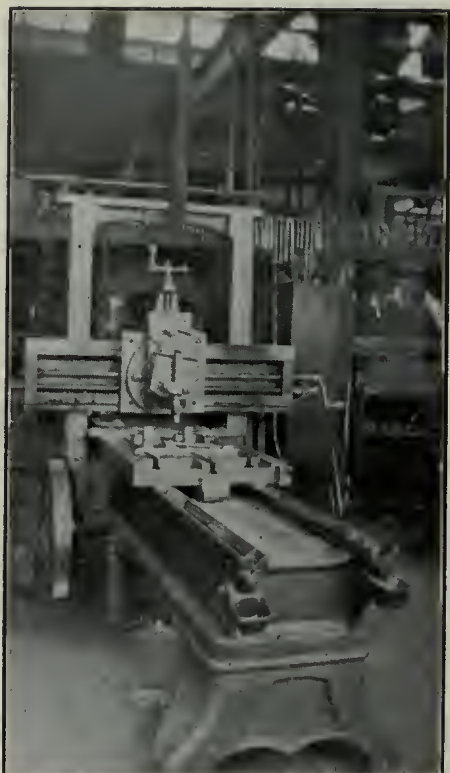
MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

SAFEGUARDING PLANERS.

By D. A. Hampson.

WHEN a guard is placed over the two gears generally found on the "off" side of a planer and a rail of some kind put around the driving pulleys, it is considered reasonably safe. However, there are two other places where guards may be employed to advantage—places where the possibilities of accidents are slight, but if accidents do take place, and a number of such are recorded, the injuries are of the most serious nature. One of these places is the open bed with its cross braces, across which the table reciprocates all day long. Should anything or anybody get caught there, the least that would result would be a broken limb. The writer has covered the gaps in a number of planer beds in the manner shown by the photograph, which is of a 20 in. x 7 ft. machine.



SAFEGUARDING PLANERS.

The covering is a length of 1-32 in. sheet steel. It has an opening cut out for the bull gear to pass through, and is held in place by its own fit and six countersunk screws. Thus safeguarded, the planer is absolutely free from any accident which might occur; the appearance is neatness itself; it is easily and quickly cleaned, and chips are prevented from falling down into the gear, reversing mechanism and bearings. Summed up, it safeguards the man, it protects the machine.

The other source of danger is the lower side of the contact area of the pinion and gear on the opposite side from the operator. As mentioned before, a guard is invariably found over these gears; but many of the guards do not fully protect from something catching in the gears when the motion is reversed. Nearly all the recorded accidents from this source have been in situations where two or more machines were arranged side by side; the operator of one machine has his back to the other, and in stooping over, one leg has been thrust out behind to balance, and the ankle or the overalls have caught in the gearing. The machines mentioned above, though it does not show in the photo, have the original guards supplemented by sections of 1-16 in. steel, entirely covering the pinion and its lower contact area.

Considering the financial standpoint, it cost an average of a little less than two dollars per planer to equip—a mere trifle compared to the "cost" of the one accident which might occur and which is thus averted.

AN IMPROVED DOUBLE BORING AND FACING JIG.

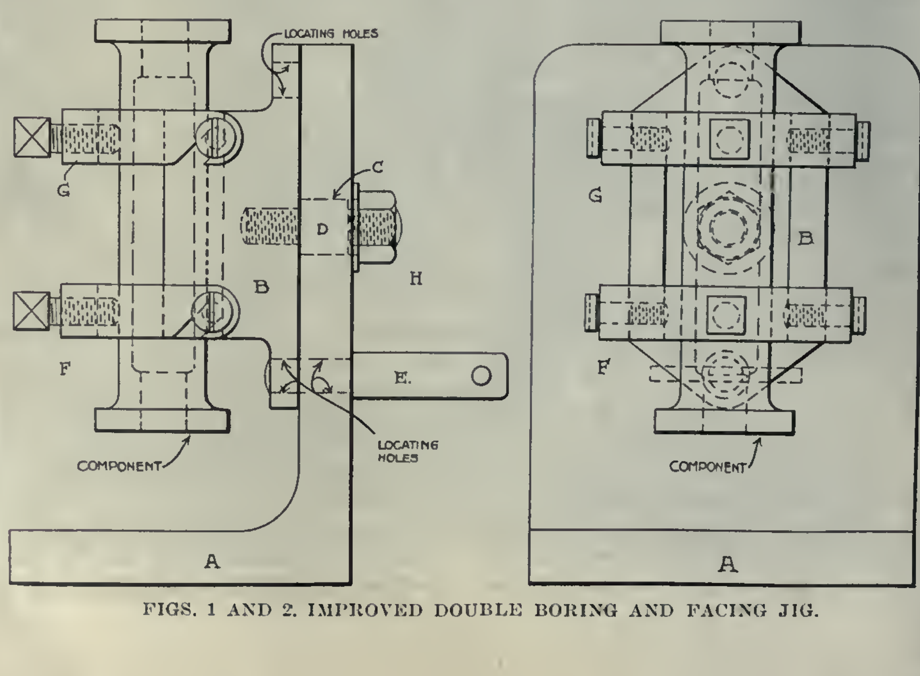
By W. G.

THE jig herewith described is of simple construction, and will be found useful for drilling and facing cylindrical work at opposite ends, particularly if the question of accurate and rapid production be considered.

The jig in question was used for boring and facing a number of small distance columns similar in shape to that shown in the accompanying drawing. The centre hole of the said component was rough cored, but it was necessary that the extreme ends should be bored out, and the faces accurately machined, in order to procure true alignment when the components were assembled. The complete machining of both ends was performed without removing the component from the jig, thus procuring absolute alignment of the two ends. A glance at the drawing will give a clear idea of the construction of the jig.

Fig. 1 is a side view showing general arrangement with compouent in position for work, while Fig 2 is an end view. The body (A) consists of a cast iron angle plate on to which is swivelly mounted the cast-iron V block (B), the latter having lugs at its extreme ends The hole (C) is for the purpose of securing the fulcrum pin (D). Part (E) is the locating plug, while (F) and (G) are the clamping straps, two of which are preferably used, being secured to the necks of the cheese-headed pins as shown. The sequence of operations is as follows:—

The component is secured to the jig by means of the clamping straps (F) (G) and the locating plug (E) passed into position, thus preventing the V block (B) from rotating. The nut (H) is next tightened, thus securing the V block to the angle plate (A) in position



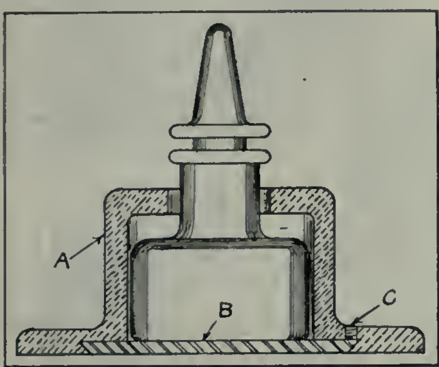
FIGS. 1 AND 2. IMPROVED DOUBLE BORING AND FACING JIG.

for work. The boring and facing operation at one end is then performed. The nut (H) is afterwards slackened off, the locating plug removed, and the V block turned round, bringing the other end of the component into operation. The locating plug is replaced, thus bringing the axis of the component into true alignment with that of the boring and facing bar.

INK BOTTLE HOLDER.

By E. W. Tate.

THE illustration shows a device used in connection with a draftsman's ink bottle, to prevent the latter being upset. The cylindrical shaped holder



INK BOTTLE HOLDER.

(A) was, in the experience of the writer, made of bronze, a material in every respect highly suitable and satisfactory. A steel plate retaining slide (B) is held in place, after the bottle is inserted, by means of the friction screw (C).

CALCULATING BAR STOCK REQUIREMENTS.

S. N. Bacon.

A TIME-SAVING table and formulae by which it is figured are given herewith. The purpose served by the table is to make it possible to tell at a glance the amount of bar stock necessary for making one thousand pieces of a certain length on the screw machine or lathe.

The first column of figures show the various lengths, and the second column, the number of feet of stock necessary; this figure being found by multiplying the length of the piece by a constant, and through the use of which, the table may be extended to include other lengths, if desired. The constant, 84.08, is derived as follows:—

Screw machine stock comes in 10-foot bars and an allowance of one inch is made for chucking on each bar. This leaves 119 inches of stock in each bar, and taking the unit length of one piece as one inch, 119 pieces can be made from each ten foot bar.

119×8=952 can be made from eight 10 foot bars.

1,000—952=48 pieces to be made from another bar.

48×1+ (1 in. allowance for chucking) =49 in.=4.08 feet.

Eight 10 foot bars=80 feet.

80+4.08=84.08 ft. for 1000 pieces 1 inch long.

Other lengths are in proportion, so that this figure 84.08 is a constant multiplier.

Length of piece and cut-off tool.	Feet per 1000	Length of piece and cut-off tool.	Feet per 1000	Length of piece and cut-off tool.	Feet per 1000	Length of piece and cut-off tool.	Feet per 1000
.050	4.2	.240	20.2	.430	36.1	.620	52.1
.055	4.6	.245	20.6	.435	36.6	.625	52.5
.060	5.0	.250	21.0	.440	37.0	.630	52.9
.065	5.5	.255	21.4	.445	37.4	.635	53.4
.070	5.9	.260	21.8	.450	37.8	.640	53.8
.075	6.3	.265	22.3	.455	38.2	.645	54.2
.080	6.7	.270	22.7	.460	38.7	.650	54.6
.085	7.1	.275	23.1	.465	39.1	.655	55.0
.090	7.6	.280	23.5	.470	39.5	.660	55.5
.095	8.0	.285	23.9	.475	39.9	.665	55.9
.100	8.4	.290	24.4	.480	40.3	.670	56.3
.105	8.8	.295	24.8	.485	40.8	.675	56.7
.110	9.2	.300	25.2	.490	41.2	.680	57.1
.115	9.7	.305	25.6	.495	41.6	.685	57.6
.120	10.1	.310	26.1	.500	42.0	.690	58.0
.125	10.5	.315	26.5	.505	42.4	.695	58.4
.130	10.9	.320	26.9	.510	49.9	.700	58.8
.135	11.3	.325	27.3	.515	43.3	.705	59.2
.140	11.8	.330	27.7	.520	43.7	.710	59.7
.145	12.2	.335	28.2	.525	44.1	.715	60.1
.150	12.6	.340	28.6	.530	44.5	.720	60.5
.155	13.0	.345	29.0	.535	45.0	.725	61.0
.160	13.4	.350	29.4	.540	45.4	.730	61.3
.165	13.9	.355	29.8	.545	45.8	.735	61.8
.170	14.3	.360	30.3	.550	46.2	.740	62.2
.175	14.7	.365	30.7	.555	46.6	.745	62.6
.180	15.1	.370	31.1	.560	47.1	.750	63.0
.185	15.5	.375	31.5	.565	47.5	.755	63.4
.190	16.0	.380	31.9	.570	47.9	.760	63.9
.195	16.4	.385	32.4	.575	48.3	.765	64.3
.200	16.8	.390	32.8	.580	48.7	.770	64.7
.205	17.2	.395	33.2	.585	49.2	.775	65.1
.210	17.6	.400	33.6	.590	49.6	.780	65.5
.215	18.1	.405	34.0	.595	50.0	.785	66.0
.220	18.5	.410	34.5	.600	50.4	.790	66.4
.225	19.0	.415	34.9	.605	50.8	.795	66.8
.230	19.3	.420	35.3	.610	51.3	.800	67.2
.235	19.7	.425	35.7	.615	51.7	.805	67.6

As an example, suppose a piece to be required, .140 in. in length, and that an ⅛ in. cut off tool is used. The total stock for one piece will be .140+125, or 265, then

265×84.08=22.3 ft. per 1000 parts, as per table.

Weight of Bar Stock.

To find the weight of any quantity of bar stock, the following somewhat simplified formula may be used:

Steel Wire=Dia.^{2}×2.6748×F=W.

Brass Wire=Dia.^{2}×2.8584×F=W.

Iron Wire=Dia. ^{2}×2.6508×F=W.

F=No. of feet of stock, and (W)= weight in pounds.

The above constants are derived as follows:—

Weight of one foot of wire of any diameter=.7854D^2×(.2836 weight of one cu. inch of steel) ×12, and this may be

Length of piece and cut-off tool.	Feet per 1000	Length of piece and cut-off tool.	Feet per 1000	Length of piece and cut-off tool.	Feet per 1000	Length of piece and cut-off tool.	Feet per 1000
.810	68.1	1.000	84.0	1.380	116.0	1.760	147.9
.815	68.5	1.010	84.9	1.390	116.8	1.770	148.7
.820	68.9	1.020	85.7	1.400	117.6	1.780	149.6
.825	69.3	1.030	86.6	1.410	118.5	1.790	150.4
.830	69.7	1.040	87.4	1.420	119.3	1.800	151.3
.835	70.2	1.050	88.2	1.430	120.2	1.810	152.1
.840	70.6	1.060	89.1	1.440	121.0	1.820	152.9
.845	71.0	1.070	89.9	1.450	121.8	1.830	153.8
.850	71.4	1.080	90.8	1.460	122.7	1.840	154.6
.855	71.8	1.090	91.6	1.470	123.5	1.850	155.5
.860	72.3	1.100	92.4	1.480	124.4	1.860	156.3
.865	72.7	1.110	93.3	1.490	125.2	1.870	157.1
.870	73.1	1.120	94.1	1.500	126.1	1.880	158.0
.875	73.5	1.130	95.0	1.510	126.9	1.890	158.8
.880	73.9	1.140	95.8	1.520	127.7	1.900	159.7
.885	74.4	1.150	96.6	1.530	128.6	1.910	160.5
.890	74.8	1.160	97.5	1.540	129.4	1.920	161.3
.895	75.2	1.170	98.3	1.550	130.3	1.930	162.2
.900	75.6	1.180	99.2	1.560	131.1	1.940	163.0
.905	76.0	1.190	100.0	1.570	131.9	1.950	163.9
.910	76.5	1.200	100.8	1.580	132.8	1.960	164.7
.915	76.9	1.210	101.7	1.590	133.6	1.970	165.5
.920	77.3	1.220	102.5	1.600	134.5	1.980	166.4
.925	77.7	1.230	103.4	1.610	135.3	1.990	167.2
.930	78.2	1.240	104.2	1.620	136.1	2.000	168.1
.935	78.6	1.250	105.0	1.630	137.0	2.050	172.3
.940	79.0	1.260	105.9	1.640	137.8	2.100	176.5
.945	79.4	1.270	106.7	1.650	138.7	2.150	180.7
.950	79.8	1.280	107.6	1.660	139.5	2.200	184.9
.955	80.3	1.290	108.4	1.670	140.3	2.250	189.1
.960	80.7	1.300	109.2	1.680	141.2	2.300	193.3
.965	81.1	1.310	110.1	1.690	142.0	2.350	197.5
.970	81.5	1.320	110.9	1.700	142.9	2.400	201.7
.975	81.9	1.330	111.8	1.710	143.7	2.450	205.9
.980	82.4	1.340	112.6	1.720	144.5	2.500	210.1
.985	82.8	1.350	113.4	1.730	145.4	2.550	214.3
.990	83.2	1.360	114.3	1.740	146.2	2.600	218.5
.995	83.6	1.370	115.1	1.750	147.1	2.650	222.7

reduced to $D^2 \times 2.6748$, as $.7854 \times .2836 \times 12 = 2.6748$.

Applying the above to finding the weight of 73.1 ft. of steel wire, .100 in. diameter:

$$100^2 \times 2.6748 \times 73.1 = 1.96 \text{ lbs.}$$

SPLASH LUBRICATION.

By H. Westwood.

ONE noticeable feature in the operation of gas engines is that the vertical engine running with the splash system consumes more oil than the hand oiled horizontal engine of the same horse power. One spot of oil at the right place is worth a quart at the wrong. In the case of the hand-oiled horizontal engine, if the cups are feeding too fast they can easily be adjusted, but, in the case of the vertical type-splash system you must keep the oil to a certain level in the crank case and let the connecting rod bolts throw all the oil that will hold to them. It is a common thing to find a 100-h.p. engine on the splash system consuming 7 to 8 gals. of oil in 24 hours, while 1 gal. will easily lubricate the hand oiled engine. I had a case some time ago of a vertical engine which consumed 5 gals. in eleven hours.

A representative of a well-known oil firm came along and said the oil I was using was no good, and if I would use his oil it would only take 1 gal. per day. This new oil was worth three times as much in price as the oil I was using; however, I decided to try two barrels. The crank case was cleaned out and 35 gals. of the new oil put in, but in order to keep the case level the same, I had to use as much of the high-priced oil as I did of the low.

I decided later to lower the oil in the crank case, and thus stop the engine throwing so much up into the cylinders. I altered the oil level so that the connecting rod bolts did not touch the oil at all. Four 1½ in. bolts and 4 nuts and cotter pins can pick up a lot of oil.

I took out the two back bolts, and drilled and tapped a hole for a ½ in. stud. I bent the stud ½ in. over at the bottom and flattened it out for an oil slinger. I then screwed the stud into the connecting rod bolt and locked it with a lock nut. The stud dipped into the oil 1½ inches. When the engine was started up, I took good care to see that the cylinders were not running hot, and, after five hours' run shut down and found the cylinder walls well oiled. This move cut the oil down to 1 gal. per day, but one half gal. in ten hours on a bearing 8 in. x 7 in. was not enough, so something had to be done to use the oil from the crank case.

I got a small pump which had been used to circulate the jacket water on an automobile. It was 1 in. bore by 1¾ in. stroke. I attached this to the side of the crank case and drove it by a ⅝ in. Con. rod attached to the end of the exhaust cam shaft. I made the pump discharge into a two gallon tank located on the back of the engine between the two cylinders and piped the oil to run through two 1 quart sight feed oil cups, one on each side main bearing, also a pipe to the centre bearing in the crank case. The oil then ran in a steady stream all the time the engine was running.

This method supplied the bearings with about 10 gals. of oil an hour, where as before they only received 1 gal. in ten hours. The wear of the bearings was not only reduced, but the engine ran smoother, and cut down the oil expense by $300 a year.

DRILL JIG AND FIXTURE DESIGN.

By H. R.

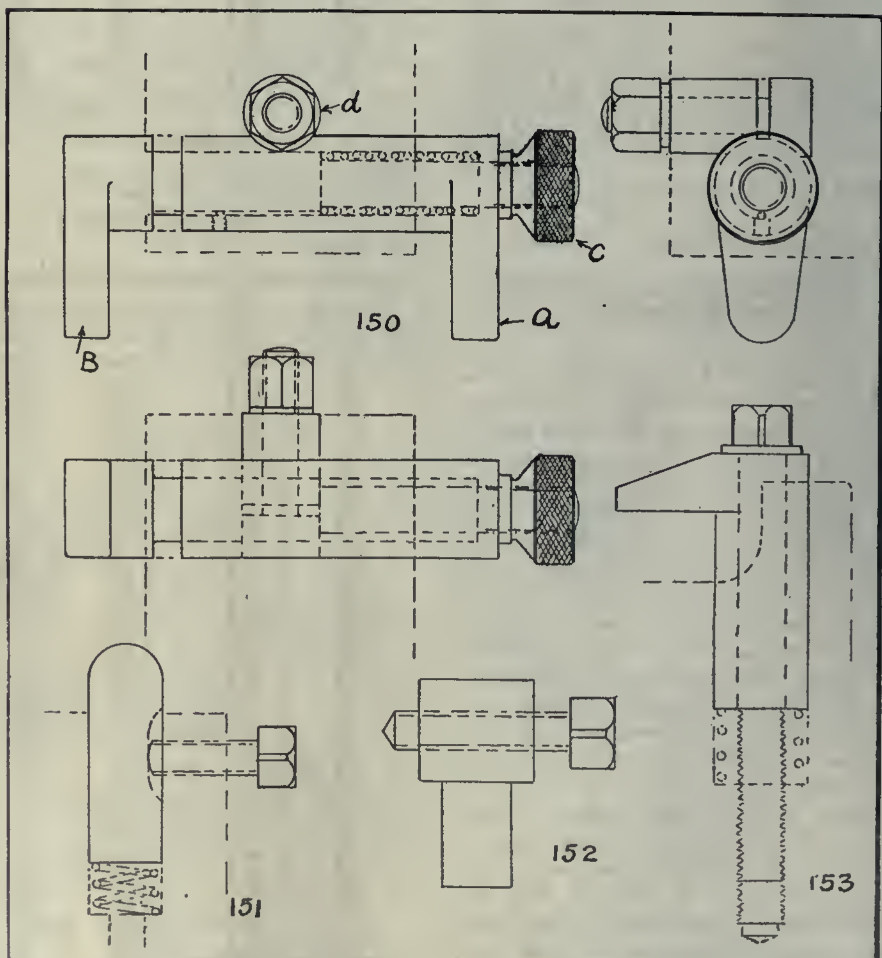
FIGURE 150 in the accompanying illustration shows clamping arrangement somewhat similar to Fig. 147 on page 455 of our November 6 issue. Its purpose, however, is to support work in quite a different manner.

Referring to the sketch, (a) is the main jaw bored to suit the other jaw (b), while both jaws are operated by the knurled screw (c), a compression spring pressing the jaw (b) against the screw. The work is held as in a vise, the jaws being secured by the wedge arrangement (d), as in Fig. 147 already referred to. The screw of the mechanism (d) operates in a slot in the body of (b), and holds it from turning against screw (c).

Fig. 151 shows a spring pin that is used for supporting work, any number of which may be used in a jig. When a rough casting is pressed upon the pin, the spring automatically adjusts the latter up to the work, and afterwards it is locked in position by the set screw.

Fig. 153 illustrates a good type of hook bolt. In this design the hook is in the form of a sliding collar, and is adjusted by a screw, but it will be well to note that all hook bolts are better backed up by a portion of the fixture as shown.

Superintendent Sullivan, of the Welland Canal, has been appointed assistant to Chief Engineer Weller. His post as head of the present canal will be filled by L. N. Hara, of St. Catharines.



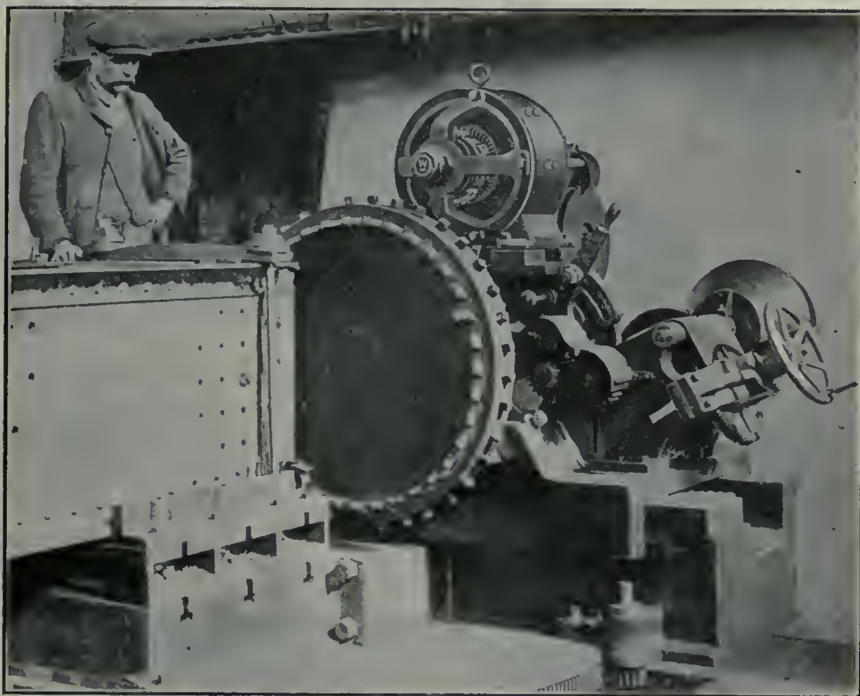
DRILL JIG AND FIXTURE DESIGN AND CONSTRUCTION.

DEVELOPMENTS IN MACHINERY

A Record of New and Improved Machinery Tending Towards Higher Quality and Economical Production in the Machine Shop, Blacksmith Shop or Planing Mill.

MOTOR DRIVEN ROTARY PLANER.

THE accompanying illustration shows an interesting form of planer for very large work, such as facing the ends of columns, cast iron bed plates, stringers, etc., and machining engine frames and other heavy castings. The cutting tools are arranged in a circle, which rotates when in operation. The machine shown can handle work 40 inches wide and 6 feet long. It is mounted on a circular base on which it can be turned, thus increasing the range of operation. It is manufactured by the Newton Machine Tool Works, Philadelphia, and is driven by a Westinghouse motor.



MOTOR DRIVEN ROTARY PLANER.

MOTOR DRIVEN PRESSURE BLOWER.

THE illustrations and data refer to a motor driven double battery blower, designed and built by the Bayley Mfg. Co., Chicago, Ill. When running at a peripheral speed of 14,000 ft. per minute, a pressure of 2 lbs. is available. Depending on the pressure required and motor speed available these blowers are made single, double, or treble battery, etc.

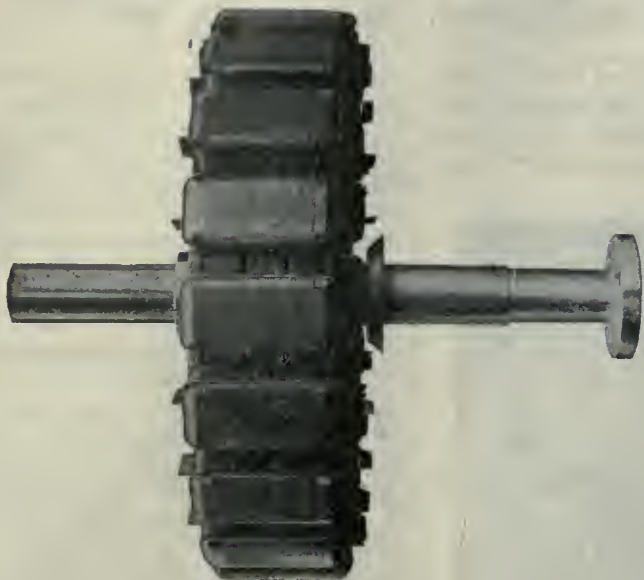
Among the considerations to which particular attention seems to have been given in the design of these blowers were the requirements of a general purpose blower; a blower suitable for cupola purposes, for oil furnaces and other work with minimum or maximum volume, and a motor driven unit.

The makers claim that not only is their product a constant delivery blower,

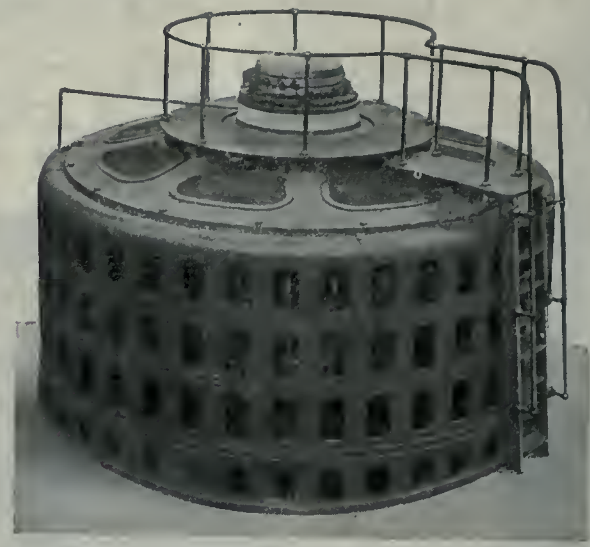
BAYLEY DOUBLE BATTERY BLOWER.

BAYLEY DOUBLE BATTERY BLOWER.

but it is positive in action up to the designed pressure—one, two, three, four and five, pounds. A low tip speed, freedom from mechanical noise, high mechanical efficiency, air delivery relative to horse-power expended, therefore, unaffected by wear, absence of gears, safety valves, etc., are other directions in which highly satisfactory results have been achieved. Installations of this type of blower have been made covering gas booster service, for agitating heavy liquids, for burning oil in small units, for burning gas, and for blowing cupolas.



STEEL PLATE ROTOR



12,500 K.V.A., 6,600 VOLT, 50 CYCLE GENERATOR COMPLETE.

LAMINATED RIM ROTOR WITHOUT FIELD POLES.

LAMINATED RIM ROTOR WITHOUT FIELD POLES.

WATERWHEEL GENERATORS.

WATERWHEEL generators have recently been built to conform with the rapid development of hydraulic power for driving electric generators. The increased demands for such service require almost infinite combinations of capacity and speed range. Refinement in the design of both generators and waterwheels have made these changes possible; the successful operation of many high voltage transmission lines and the ever-increasing demand for power, all aid materially in the utilization of many water powers heretofore considered either impracticable or inaccessible.

Two types of waterwheel generators are built—horizontal and vertical, depending upon the local conditions in each case, and these, of almost any practical capacity or speed for installation in the smallest isolated plant or the largest hydro-electric generating station have been furnished by the Westinghouse Electric & Mfg. Co., Pittsburgh, Pa.,

Horizontal Type.

The standard horizontal unit is of the two-bearing, coupled type construction; that is, the generator includes shaft, two-bearings and a bedplate usually designed to allow for sliding the stator to one side in case ready access to either the stationary or rotating winding is desired.

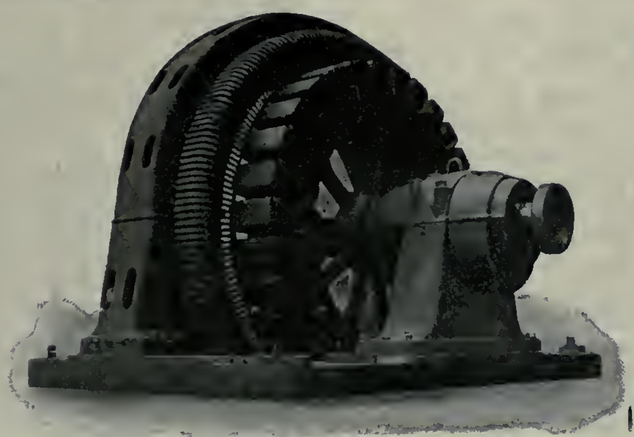
The stationary frame is a strong, rigid iron casting, into which soft steel laminations are dove-tailed and securely fastened..

Ventilating ducts are spaced at frequent intervals across the face of the armature punchings, allowing for perfect ventilation to all parts of the active material. Form wound, interchangeable armature coils fit into parallel open slots punched in these laminations, and the coils are held firmly in place by means of fibre wedges. The coils are insulated and impregnated with fabrics and compounds of high insulating qualities.

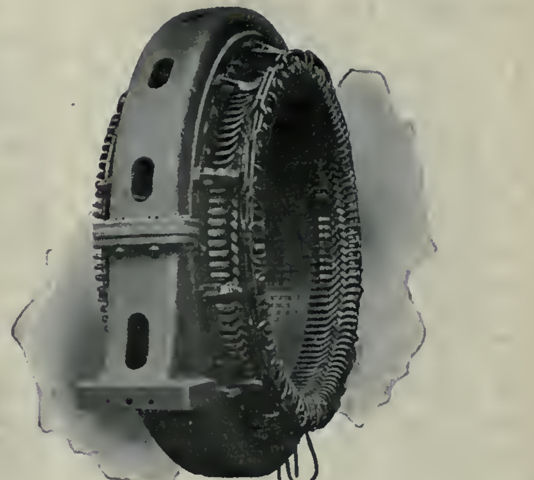
No single type of construction will meet the varied requirements in rotor design, therefore, several well tested methods are employed. When comparatively low peripheral speeds are encountered, a cast-iron spider with bolted-on, or dove-tailed poles, is usually employed. For higher speeds, cast steel or steel plate construction may be used. In the case of very large relatively high speed machines, the difficulty of securing perfect castings may lead to the well-proven laminated rim structure.

All field poles are made of thin steel laminations riveted together with overhanging pole tips provided to support the field windings. Field coils are wound of heavy copper strap on edge, insulated in such a way that each individual turn is exposed to the ventilating air, and thus perfect radiation results. The coil is securely fastened between the rotating spider and the tips of the field poles by heavy coil supports.

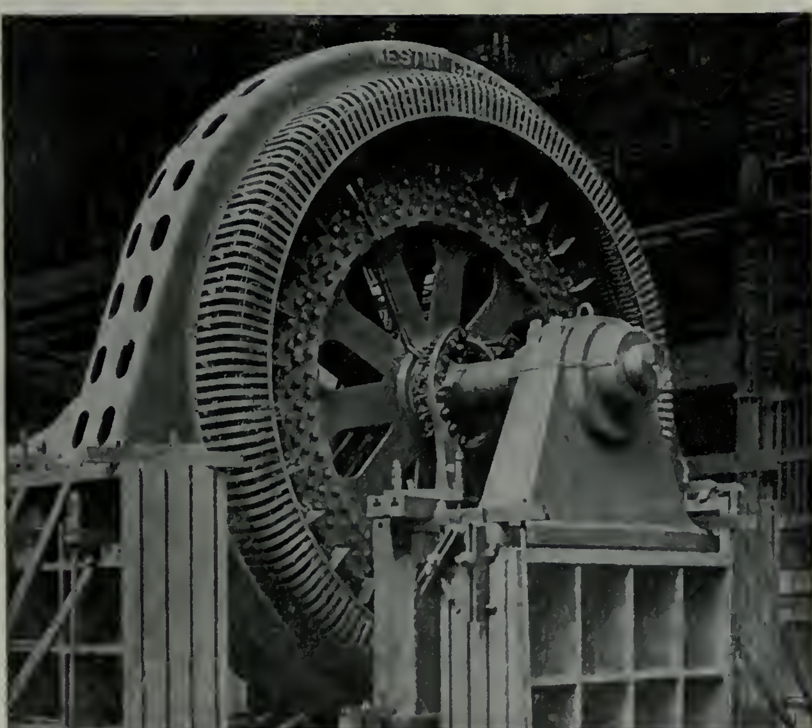
All parts are inspected during each step in the process of manufacture, and before the succeeding operation is started. When completed, the machine is tested under conditions, as nearly identical as possible, to those which its future service will demand.



ARMATURE STRUCTURE FOR 1,000 K.V.A., 13,800 VOLT., 60 CYCLE UNIT.



SHOWING METHOD OF SLIDING STATOR TO ONE SIDE.



9,375 K.V.A., 6,600 VOLT UNIT IN SHOP TESTING RIG.

Vertical Type.

Westinghouse standard practice recommends that the generator be fitted with two guide bearings which are supported by brackets fastened to the stator frame; also, a bedplate or pad on which the stationary part rests. The roller or thrust bearings which support the weight of the revolving part may be mounted on top of the generator frame between generator and turbine, or underneath the turbine. In case it is mounted on top of the generator frame, this frame must of course be made heavier and more expensive, than in cases where it has only to support the stator punchings, winding and guide bearings. Wherever placed, this bearing usually supports not only the rotor of the generator, but also the turbine runner, and in addition, takes care of any unbalanced water thrust. A rigid cast iron frame into which soft steel laminations are securely dove-tailed, forms the basis of the stator.

Form wound, interchangeable armature coils are held in open slots by means of fibre wedges. The coils are vacuum dried and impregnated before the outside insulation is applied. This outside insulation consists of wrappings of paper and mica on the straight portions of the coils which lie in the slots, and servings of treated cloth over the V-shaped coil ends. After the outside insulation is applied, the coils are treated with an insulating varnish which renders them moisture and oil-proof. An insulating cell is provided in each armature slot to prevent abrasion of the coil, and a fibre wedge holds coil and cell firmly in position.

In case of failure of a waterwheel governor to act, the rotating part of both waterwheel and generator are subjected to unusual stresses, due to the overspeeding of these parts. The rotors here illustrated are designed for the maximum obtainable speeds which result in such instances. These overspeeds vary from 50 to 100 per cent. Due to the wide range of speeds encountered, no one type of rotor construction will give ideal results. There are several designs of rotors, each one particularly well adapted for the requirements for which it is used. Comparatively low peripheral speeds may permit the use of a cast-iron spider with either bolted-on or dove-tailed poles.

FOUNDRY PRACTICE AND EQUIPMENT

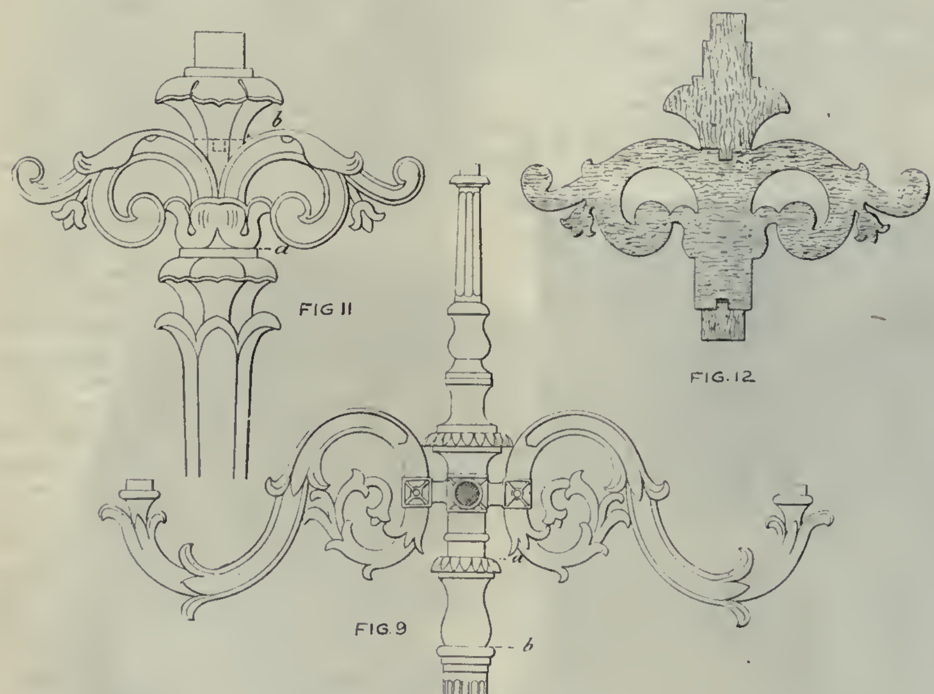
Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

CARVED LAMP STANDARDS.—II.

By Joseph Horner.

IN the vast variety met with in the designs of columns, questions arise which have to be answered suitably to the particular circumstances of each. To this aspect of variations this article will be devoted.

Very many lamp standards have a cross-piece at the top. Whether it be required for the support of lamps or not, if for no other reason it is wanted to rest a ladder against, and this is usually made an occasion for ornament. Unless these are very short and plain, they are not usually cast with the main column, but are attached separately, like that illustrated in the last article. It is much easier and cheaper to treat them thus than to extend the sides of the column moulding box awkwardly to receive them, and to run the great risk of their becoming knocked off in the handling of the casting for fettling.



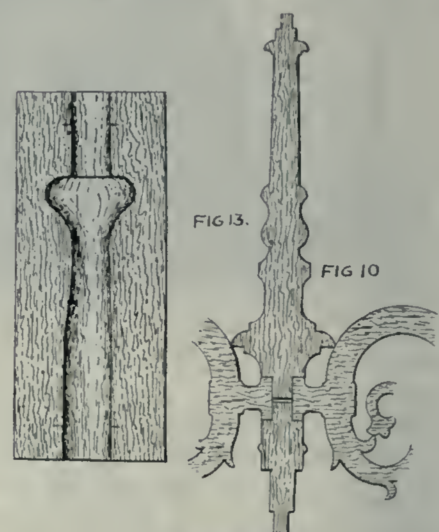
FIGS. 9, 11, 12. CARVED LAMP STANDARDS.

In much of this work the shortness of the timber grain in places renders careful handling necessary. Thus, in the standard top, Fig. 9, the termination of the stem or shaft and the scroll-shaped arms would be cast together, and the carving be done so as to avoid undercut and prevent the necessity of leaving any portions loose. The combined casting can be fitted into the top of the shaft either at (a) or at (b). The only way to make a decent pattern of this is as indicated in Fig. 10.

The arms are cut from one piece of stuff, and the upper and the lower portions of the stem are pinned and glued into it, after the manner shown in the Fig., which represents the jointed portion of one-half of the pattern lying open in the joint face. It is at the best somewhat flimsy, and for standard use it should be made in iron, but some hundreds might be moulded by plating a wooden pattern on an ordinary joint board. The halves of the pattern can be mounted on opposite sides of one board, or on separate boards, taking care to ensure their matching in the top and bottom moulds. Another way is to model a half pattern on a board in clay and cast pattern halves from that.

To get symmetrical shapes in wood the curves are marked preferably on one joint face first, which is then sawn round with a bandsaw, and the second half cut from that. The curves may be marked directly on the wood, but it is better to mark them on paper, folding the paper in a line which corresponds with the centre or axis of the column, and then, having cut to the lines with a penknife or small scissors, unfold it and glue it on the joint face of the pattern. Both sides will then be quite symmetrical.

Having cut round the edges, the carved faces are next treated, using



FIGS. 10, 13. CARVED LAMP STANDARDS.

gouges chiefly of various curvatures, vee tools for veining, and chisels in places. The eye judges of results, opposite sides being compared for symmetry, and kinks and flats being all merged in flowing curves. The real work must be done with the cutting tools—the rasps, rifflers and glasspaper being reserved for smoothing only.

An alternative design is shown by Fig. 11. This is not so slender as the last, and is, from the patternmaker's point of view less troublesome to make. The jointing to the column is at (a). The pattern parts are jointed at (b) with a stud. Fig. 12 shows the half pattern

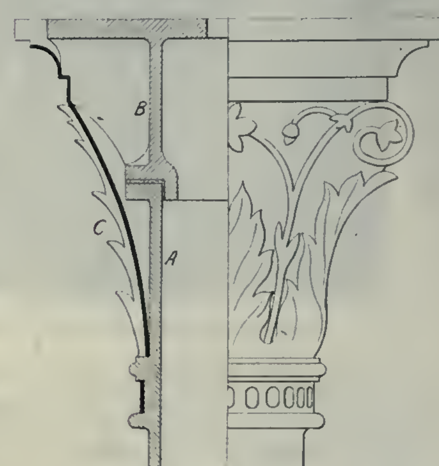


FIG. 14. CARVED LAMP STANDARDS.

open in the joint face with the spigot by which it is socketed into the main shaft, and the core prints.

When a considerable difference exists in the diameters, it is better to make a core to follow the outlines instead of putting a straight one through. The core can be swept against the edge of a board if only a few castings are required, but for standard work a box should be cut out, Fig. 13. A half box will answer well enough, the half cores from which will be pasted together. If an entire box is made to core out the cross arms, as in Fig. 8 in the last article, the core cannot be rammed from the ends, but each half must be rammed from the joint face and pasted together. The box must be battened across the back to prevent it from curving crosswise.

The carved work on highly ornamental capitals often occasions much difficulty. Several courses lie open. One is to cast the capital on the shaft, design the foliation to entail the least possible amount of undercut, and so leave the fewest pieces necessary to be loosely wired on. Not very much can be done in this way in highly foliated designs.

Another way is to cast the capital distinct from the shaft; then, being unattached, a great deal can be done in the way of main longitudinal jointing, supplemented by small loose pieces. A Corinthian capital may be moulded thus, but the pattern work is very expensive and the moulding very tedious.

A third way, very commonly adopted, is to cast the foliations in pieces separate from the cap itself and screw them on. These may then be cast thin, in brass, without the liability to fracture of thin iron castings. Fig. 14 shows how a column of this kind can be built up. The shaft (A) of the column is parallel, terminating in a flange. To this, the skeleton of the upper part of the capital is bolted, and on these, as shown, the strips of foliations (C) are screwed with stove screws. These are readily cast in malleable iron, or in brass. Being thin, they are not very expensive if in brass, and if the lines of joints show, they can be pened down or filed.

BRIDGE BUILDERS' CONVENTION.

THE Twenty-Third Annual Convention of the American Railway Bridge and Building Association was held in Montreal, October 21-23. This is the second occasion on which the convention has been held in Canada, that of ten years ago having taken place in Quebec. The Windsor Hotel was chosen as the Association's headquarters, and here a large number of delegates assembled under the presidency of Mr. A. E. Killam, of Moncton, N.B. During the first day a considerable amount of business was transacted, three sessions being held. Over one hundred new members were elected, a large number of them being Canadians.

A formal welcome to the visitors was extended by Mr. William McNab, assistant chief engineer of the Grand Trunk Railway, in his address, which opened the morning session. He spoke of the tie between the Americans and Canadians who were engaged in the same branch of work, and the beneficial influences of such a gathering, referring to the technical and social elements entering into the proceedings. It was appropriate that the Convention should take place in Montreal, where, in the immediate vicinity, were two noteworthy bridge structures, one being the Victoria bridge; the other the C.P.R. bridge, which had just been rebuilt and double-tracked, remaining in service while this work was being done.

The President of the Association, who also welcomed the members to Montreal, referred to the history of the organization and its last meeting on Canadian soil, speaking of the value of the technical reports, and expressing his satisfaction at the work of the various committees.

An extensive programme of entertainments for the delegates and their families was carried out. This included a drive around Mount Royal, a theatre party, and a trip down the Lachine rapids. More serious items on the programme took the form of visits to the two bridges across the St. Lawrence. An inspection of the large plant of the St. Lawrence Bridge Co. at Rockfield was also made. Here were seen in course of construction the component parts of the great cantilever bridge that is to span the St. Lawrence at Quebec. The visitors were very favorably impressed with this plant, which is, without doubt, one of the finest of its kind on the American continent.

At the final session of the Convention on Thursday morning, October 23, the following officers were elected for the ensuing year:—President, J. N. Penwell, L. E. and W. Railway, Tipton, Ind.; first vice-president, L. D. Hadwen, C. M. & St. Paul Ry., Chicago; second vice-president, G. Aldrich, N.Y., N.H. & H.R.R., Boston, Mass.; third vice-president, G. W. Rear, S. P. Co., San Francisco, Cal.; fourth vice-president, C. E. Smith, Mo. Pac. System, St. Louis; secretary, C. A. Lichty, C. & N. W. Ry., Chicago; treasurer, J. P. Canty, B. & M. R.R., Boston.

Sir Alexander Binnie has been elected engineer-in-chief of the Ottawa Gatineau Lakes water scheme, the employment fee being $400,000, out of which Sir Alexander is to pay his small army of subordinate engineers and inspectors.

Recent Judicial Decisions

Ottawa, Ont.—Mr. Justice Cassels has handed down judgment in the matter of the petition of Gebr Noelle of Ludenscheid, Germany, manufacturers of Britannia metalware goods, for an order of the court declaring them entitled to register a general trade mark consisting of the word "Albaloid," as applied to the various articles manufactured by them. Previous to filing their petition in the Exchequer Court the Minister of Agriculture had refused to enter the Noelles' mark in the register of trade marks, on the ground that a prior general trade mark consisting of the word "Albolene" had been registered by McKesson & Robbins, wholesale druggists of New York. The judgment handed down refuses registration of a general trade mark, but authorizes the registration of a specific trade mark consisting of the word "Albaloid," as applied to the metalware goods manufactured by Noelle Brothers, the petitioners. The case is the first to arise in the court where the registration of a general trade mark is asked for, which might conflict with a prior general trade mark on the registry. The learned Judge expresses the opinion that once a general trade mark has been registered for a particular word, the same word could not be registered as a general trade mark by anyone else. He holds that a general trade mark covers all the classes of merchandise in which the applicant deals, but that registration of a general mark does not confer an unlimited right the world over to exclude other persons carrying on business of an entirely different character from obtaining a specific trade mark of the same word or device as applied to the particular goods they manufacture, and which the owner of the general mark does not.

A Port Arthur Protest.—The alert Board of Trade at Port Arthur, Ont., and many private firms in the city are making strenuous objection to the steps being taken to bring the new steamer Noronic to Sarnia to be completed. The Port Arthur people point out that the Shipbuilding Company received a bonus from that city, and that the inducements were the employment that would be offered to the citizens, and supplies that would be bought, etc. They claim that the removal of the boat means that nearly two hundred men will be employed in Sarnia all winter, that otherwise would be employed in Port Arthur, with a corresponding loss to the business revenues of the town.

TRADE AND COMMERCE RECORD

Dealing With the Steps Being Taken and Progress Made by Industrial Canada To Achieve and Maintain a Dominant Place in the Markets of the World.

CANADA'S GREAT FIRE LOSS.

THAT the fire loss of Canada per capita is higher than any other country in the world is shown by statistics issued in a Conservation Commission bulletin.

The per capita loss in Canada in cities of over 20,000 population last year was $2.88, as compared with $2.55 in the United States, 54 cents in England, and 84 cents in France.

"Unless there is loss of life, our Canadian public regards destruction of fire with altogether too much complacency," says the bulletin, and goes on to state that many of the larger structures in Canadian cities are not built with a due regard for safety. The following table of comparative fire losses in different countries, during 1912, tells its own story:

Cities Over 20,000 Population.

	Cities reporting	Population	Per capita loss
Canada	5	957,372	$2.88
United States	300	32,326,633	2.55
England	12	7,164,849	0.54
France	6	4,425,696	0.84
Germany	9	2,659,575	0.20
Ireland	2	699,802	0.57
Scotland	2	485,091	0.49
Italy	3	282,082	0.90
Russia	2	3,485,583	0.84
Austria	4	2,658,978	0.30

FEDERAL REVENUE INCREASE.

REVENUE figures for the first seven months of the year show that the receipts have been $96,191,614, or some five millions more than in the corresponding period of last year. The excise and post-office revenues show an increase of a million, while the Customs figures are about the same as last year. The takings in the Railway and Canals Department lead those of last year by $1,300,000, while the miscellaneous revenues, derived from sales of land, etc., show heavy advances.

Detailed reports of Canadian trade for the first five months of the present fiscal year show that Canada's imports from and exports to the United States for the five months totalled $243,202,226, or nearly 60 per cent. of the Dominion's total trade with the world. Trade with Great Britain totalled $133,879.408, and with the British Empire $152,110,069.

Imports from the United States for the five months totalled $186,384,959, as compared with $61,070,476 from Great Britain, and $286,184,572 from all countries. Exports of Canadian products to the United States totalled $56,817,267, and to Great Britain $72,808,932.

Canada's sales to British Dominions and Colonies during the five months totalled nearly $11,000,000.

BRITISH EXHIBITION TRAIN.

AS previously announced, it is proposed that an exhibition train of British manufactures should travel through Canada next year. Up to date, the idea generally favored is that there should be eight exhibition cars and sixteen salesmen. It is suggested that it would be better that the large cities in the United Kingdom should each hire a car than that each special trade should have a conveyance of its own. It is recommended that exhibits be in such a form as will enable them to be constantly changed, and, further, in order to ensure freshness of display, alternate exhibits are desirable.

Two-Day Stands.

The exhibition train will stay in a town at least two days, and in the more important centres a week or longer. This will give ample time for all articles to be shown in each town. A firm, therefore, may have two independent sets of exhibits to be shown alternately, or they may appear turn and turn about with another firm, thus halving the expense. Practically everything that can be shown in a store window or carried by a traveller, can be exhibited. Makers of heavy machinery can show models, and, of course, photographs.

Of the $150,000 necessary, the Canadian Pacific Railway charges will come to $75,000.

CANADA NEEDS U.S. COAL.

COAL exportation of the United States for 1913 will approximate $100,000,000. This places them third among the coal exporting countries of the world, being exceeded only by the United Kingdom and Germany. Anthracite coal comprises about one-third of the total exports, and goes almost exclusively to Canada. For bituminous coal, Canada also is a large customer, taking eight and a half millions out of the twelve million tons exported in the eight months ending with August.

MINERAL DEVELOPMENT IN ONTARIO.

"THE mining industry of Ontario continues to expand, not only in quantity and value of the annual production, but also the area embraced within its operation," says Thomas W. Gibson, Deputy Minister of Mines, in his statistical review of the Bureau of Mines for 1913.

Returns made by mining Companies and mine owners show the aggregate production of minerals to have a value of $48,341,612, against $41,976,797 for the year 1911, or an increase of $6,364,815, or 14.9 per cent.

The wages paid in mining operation totalled $8,392,907. Of this amount $3,543,419 was paid to silver mines operatives, $1,245,361 to gold mines operatives, and $2,404,889 to nickel mines operatives. There are 9,362 employees in the mining industry.

The total production of metals in Ontario has a representative value of $225,706,378, and if the nickel and copper were valued at the prices of the refined metals in New York according to methods employed by the Department of Mines at Ottawa, the total would be about $290,000,000.

Product.	Value.
Gold	$ 4,734,713
Silver	97,176,289
Platinum and palladium	290,755
Cobalt	1,072.141
Nickel	41,012,763
Copper	17,239,531
Iron ore	6,724,385
Pig iron	57,246,101
Lead	117,290
Zinc ore	92,410

Since 1894, when the first silver was obtained from the mines at Cobalt, the production of the camp has amounted in all to 155,815,839 ounces, representing a value of $81,731,115. The high prices of silver in the year 1912 resulted in the distribution of large dividends to shareholders of silver mines.

Dividends of $9.324,049, or $590,091 more than in the previous year, went into the pockets of shareholders, bringing the total amount of dividends and bonuses, not including the profits made by private owners, up to $39,834,740. Profits made by private owners would aggregate nearly $5,000,000 more.

Producing Mines.

The producing mines numbered 30 as against 34 in 1911, those having an output of a million ounces or more being:

Mine Name.	Ounces Shipped.
Nipissing	4,719,578
Coniagas	3,703,942
La Rose	2,920,344
Crown Reserve	2,714,766
McKinley-Darragh-Savage	2,704,868
Kerr Lake	1,895,309
Buffalo	1,890,150
Cobalt Townsite	1,505,396
Timiskaming	1,242,243
Cobalt Lake	1,123,146
O'Brien	1,091,631

Cement.

The cement produced in Ontario last year amounted to 2,993,367 barrels, representing a factory price of $3,365,659, an increase of 17,482 barrels, or $74,893 over the production of the previous year.

CANADA'S WHEAT.

At the end of September, reports to the Census and Statistics Bureau gave the total estimated wheat production of Canada for 1913 as 207,575,000 bushels, an increase of 8,339,000 bushels over the yield of 1912. The yield per acre was 21.15 bushels, as against 20.42 last year. The total yield of oats was 391,418,000 bushels, an increase of 30,000,000 bushels; barley, 44,348,000 bushels, an increase of 344,000 bushels; rye, 2,559,000 bushels; peas, 3,974,000; flax, 14,913,000; corn, 14,086,000 bushels.

For the three North-West Provinces, the total yield of wheat is estimated at 189,116,000 bushels; oats, 39,595,000 bushels; barley, 27,904,000 bushels; rye, 686,000 bushels.

NEW GOVERNMENT ELEVATOR AT PORT ARTHUR, ONT.

The new Dominion Government terminal elevator at Port Arthur, Ont., is now ready and in operation. It is the result of a long agitation by Western farmers who wanted the guarantee of the Government behind the marketing of their grain at the Head of the Lakes. The people's elevator, as it is known locally, will be the standard for many years to come. It is absolutely the last word in elevator construction, is the biggest individual elevator in the world, and brings Port Arthur's elevator capacity up to 15,350,000 bushels. There is also a large capacity at the sister city of Fort William.

Constructional Features.

The elevator is of reinforced concrete construction throughout and fireproof. The machinery is operated by electric power, a separate motor being installed for each unit. Twenty cars can be unloaded simultaneously, the unloading capacity of the house being forty cars per hour. An interlocking device connecting the valves of the car hoppers prevents any possibility of the mixing of the contents of one car with another.

The normal loading capacity to boats is about 75,000 bushels per hour, but for the first hour this can be increased to 115,000 bushels. The working house towers to a height of 185 feet above water level, and contains 75 circular bins of about 7,000 bushels capacity each, 56 interspace bins of 3,000 bushels, and 36 outer space bins of 1,500 bushels each. The total capacity is about 750,000 bushels.

The storage house has 70 circular bins, each 24 feet in diameter and 90 feet in height, of 30,000 bushels' capacity, together with 54 inter-spaces of about 8,000 bushels each, giving a total capacity of 2,500,000 bushels. The total capacity of the elevator is, therefore, 3,250,000 bushels. In designing the elevator, especial provision was made for a large number of bins of small capacity for storing small lots of grain that may require separate binning.

Cleaning and Drying Plant.

The working house is equipped with 10 hopper scales of 2,000 bushels each, with a garner of equal capacity over each scale. The elevator legs are as follows:—Five for receiving, 5 for shipping, 5 for cleaning, 1 for screenings, 1 for drying, 1 for oats, and 2 for flax. Fifteen sets of receiving cleaners are provided for cleaning oats, wheat, and barley, and 15 additional cleaners can be installed when needed. Special machines are also installed for separating oats from wheat, in addition to two screening separators and two flax separators.

Separate Drying Plant.

At the south side of the working house, a drying plant is installed in a separate building. This has a capacity of 48,000 bushels per day, and is for drying damp, tough or wet grain, and putting such grain in condition for storage.

A revetment wall is being built around three sides of the site, which contains about 32½ acres. The site was formerly covered by water, but it now filled in level with the top of the revetment wall.

DOMINION GOVERNMENT NEW TERMINAL ELEVATOR AT PORT ARTHUR, ONT.

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JOHN BAYNE MACLEAN - - - - - President

H. T. HUNTER - - - - General Manager

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Vol. X. NOVEMBER 13, 1913 No. 20

PRINCIPAL CONTENTS.

CANADIAN VICKERS SHIPYARD AT MONTREAL.

IN our October 30 issue, considerable space was devoted editorially to the shipyard plant of the Canadian Vickers Company at Montreal. Mention was then made of the progress being made, and an outline sketch given of the projected capacity and final equipment and compass of the undertaking. We have since been officially informed that within the next two years the whole establishment will be completed, and, needless to say, the addition to Canada's industrial sphere of such an enterprise will open up new opportunity and afford extended scope to those developing our natural resources, and to the many others who will find direct and indirect occupation through its instrumentality.

THE "LEONARD" SHOPS OF THE N.T.R. AT QUEBEC.

PUBLICATION is made in this number of our journal of an outline description of the principal features of note entering into the layout, construction and equipment of the new locomotive and car repair shops of the National Transcontinental Railway at Quebec, work on the erection of which was begun some weeks ago.

We note with pleasure that, in spite of the many changes of personnel in almost every Department of Canadian Government service, recently, the men who have been responsible for similar undertakings in the past, and who have carried these to successful completion and operation are again directing this latest installation. There is, of course, no particular credit due "the powers that be" for such an eventuality, no more was there any good and sufficient reason for making a change outside of finding room for a party "heeler."

The layout and equipment of the N.T.R. shops at Transcona, near Winnipeg, brought commendation from a wide circle of railroad and general mechanical engineering experts, for the facilities provided and the general advances made in different directions relative to efficient and rapid handling of raw and finished materials, and rolling stock. The experience gained in the layout of the Transcona plant was both unique and valuable, and was only possible of acquirement to the fullest extent by the guiding and directing engineer.

That such an experience has been appropriated is amply evident from this preliminary sketch of the shops, etc., at Quebec, and, while it is true that their completion and operation will, in the nature of things, suggest improvements considerably in advance of what is presently up-to-date, it is satisfactory to know that this latest plant will be without peer for its purpose, anywhere.

The midway feature of the Leonard shops is, we think, worthy of special notice and attention by those responsible for railroad equipment and rolling stock repair plants generally, due to the deviation from previous practice in its relation to the various departments which it is called upon to serve. When one comes to think of it, there is a feeling of surprise that the change had not taken place on the occasion of other plants' layout, and in looking for a reason for the continued adherence to the old arrangement, there is little beyond the fact that a deep rooted idea that raw material dumped at one end of a factory and leaving it at the other end as a finished product gave a concrete example of our highest conception of systematic manufacture.

It will be abundantly evident even to the uninitiated that the arrangement planned for the Leonard shops will far surpass the old method, and while this particular feature is the only one singled out for notice here, we are quite certain that in many other directions, there will be found improvements along the lines of higher degree system and efficiency, than have yet appeared in similar installations.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

	Mont'l.	Tor'to.
Grey Forge, Pittsburg	.....	$14 25
Lake Superior, charcoal, Chicago	.....	15 25
Middlesboro, No. 3	20 00	21 50
Carron, special	22 50	.....
Carron, soft	22 50	.....
Cleveland, No. 3	20 00	22 00
Clarence, No. 3	20 00	21 00
Jarrow	.....	23 50
Glengarnock	......	26 00
Michigan charcoal iron	27 00	.....
Ferro Nickel pig iron (Soo)	.....	25 00
Victoria, No. 1	19 15	18 00
Victoria, No. 2	18 65	17 50

BILLETS.

	Per Gross Ton.
Bessemer billets, Pittsburgh	$22 00
Open hearth billets, Pittsburgh	22 00
Forging billets, Pittsburgh	26 00
Wire rods, Pittsburgh	26 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto	2.10
Steel bars, f.o.b., Toronto	2.15
Common bar iron, f.o.b., Montreal	2.10
Steel bars, f.o.b., Montreal	2.15
Bessemer rails, heavy, at mill	1.25
Steel bars, Pittsburgh, future	1.30
Tank plates, Pittsburgh, future	1.30
Beams, Pittsburgh, future	1.30
Angles, Pittsburgh, future	1.30
Steel hoops, Pittsburgh	1.50
F.O.B., Toronto Warehouse.	**Cents.**
Steel bars	2.25
Small shapes	2.35
Warehouse, Freight and Duty to Pay.	**Cents.**
Steel bars	1.80
Structural shapes	1.90
Plates	1.90

Freight, Pittsburgh to Toronto.

18 cents carload; 21 cents less carload.

IRON PIPE FITTINGS.

Canadian malleable, 40 per cent.; cast iron, 65; standard bushings, 70; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 77½; malleable, lipped unions, 65.

NAIL AND SPIKES.

Standard steel wire nails, base	$2 30	
Cut nails	$2 60	2 65
Miscellaneous wire nails	75 per cent.	
Pressed spikes, ⅝ diam., 100 lbs.	2 85	

BOILER PLATES.

		Mont'l.	Tor'to.
Plates, ¼ to ½ in., 100 lbs.		$2 35	$2 30
Heads, per 100 lbs		2 65	2 65
Tank plates, 3-16 in		2 60	2 40
Tubes, per 100 ft.,	1 inch	9 50	8 50
" "	1¼ in.	9 50	8 50
" "	1½ "	9 50	9 00
" "	1¾ "	9 50	9 00
" "	2 "	8 75	8 75
" "	2½ "	11 15	11 50
" "	3 "	12 10	12 50
" "	3½ "	14 15	14 50
" "	4 "	18 00	18 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Stove bolts	80 & 7½
Machine bolts, ⅜ and less	65 & 10
Machine bolts, 7-16	60
Blank bolts	60
Bolt ends	60
Machine screws, iron, brass	35 p.c.
Nuts, square, all sizes	4¼ per lb off
Nuts, Hexagon, all sizes	4½ per lb off
Fillister head	25 per cent.
Iron rivets	60, 10 p.c. off
Wood screws, flathead, bright	85, 10, 7½ p.c. off
Wood screws, flathead, brass	75, 10, 7½ p.c. off
Wood screws, flathead, bronze	70, 10, 7½ p.c. off

National-Acme "Milled Products."

Sq. & Hex. Head Cap Screws	65 & 10%
Sq. & Hex. Head Cap Screws	65 & 10%
Rd. & Fil. Head Cap Screws	45-10-10%
Flat & But. Head Cap Screws	40-10-10%
Finished Nuts up to 1 in	75%
Finished Nuts over 1 in	72%
Semi-Fin. Nuts up to 1 in	72%
Semi-Fin. Nuts over 1 in	72%
Studs	65%

Discounts, f.o.b., Montreal.

OLD MATERIAL.

Dealers' Buying Prices.	Mont'l.	Tor'to.
Copper, light	$10 50	$11 50
Copper, crucible	14 00	13 50
Copper, uncr'bled, heavy	13 00	12 50
Copper wire, uncre'bled	12 50	12 50
No. 1 machine compos'n	11 00	11 50
No. 1 comps'n turnings	9 50	9 50
No. 1 wrought iron	10 00	9 00
Heavy melting steel	8 50	10 00
No. 1 machinery cast iron	13 00	14 00
New brass clippings	8 50	9 00
No. 1 brass turnings	7 25	8 00
Heavy lead	3 75	4 25
Tea lead	3 00	3 20
Scrap zinc	3 00	3 50

WROUGHT IRON PIPE.

The following are Toronto jobbers' discounts on pipe in effect from April 21, 1913:

Standard	Buttweld Black	Buttweld Gal.	Lapweld Black	Lapweld Gal.
¼, ⅜ in.	64	49	....	....
½ in	68	58	....	....
¾ to 1½	73	63	....	....
2 in.	73	63	69	59
2½ to 3 in.	73	63	72	62
3½ to 4 in.	71½	61½	70½	60½
4½ to 6 in.	....	....	71½	61½
7, 8, 10 in.	....	....	66	54
X Strong P. E.				
¼, ⅜ in	56½	46½	....	....
½ in.	64	54	....	....
¾ to 1½ in.	68	58	....	....
2 to 3 in.	69	59	....	....
2½ to 4 in.	....	....	66	56
4½ to 6 in.	....	....	64	56
7 to 8 in.	....	....	55	45
XX Strong P. E.				
½ to 2 in.	43	33	....	....
2½ to 4 in.	....	....	43	33

PRICES OF WROUGHT IRON PIPE.

Standard. Nom. Diam.	Standard. Price. per ft.	Extra Strong, Sizes Ins.	Extra Strong, Price per ft.	D. Ex. Strong, Size Ins.	D. Ex. Strong, Price per ft.
⅛in	$ .05½	⅛in	$ .12	½	$ .32
¼in	.06	¼in	.07½	¾	.35
⅜in	.06	⅜in	.07½	1	.37
½in	.08½	½in	.11	1¼	.52½
¾in	.11½	¾in	.15	1½	.65
1 in	.17½	1 in	.22	2	.91
1¼in	.23½	1½in	.30	2½	1.37
1½in	.27½	1½in	.36½	3	1.86
2 in	.37	2 in	.50½	3½	2.30
2½in	.58½	2½in	.77	4	2.76
3 in	.76½	3 in	1.03	4½	3.26
3½in	.92	3½in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4½in	1.27	4½in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.86	...	.....
7 in	2.38	7 in	3.81	...	.....
8 in	2.50	8 in	4.34	...	.....
8 in	2.88	9 in	4.90	...	.....
9 in	3.45	10 in	5.48	...	.....
10 in	3.20	....	.....	...	.....
10 in	3.50	....	.....	...	.....
10 in	4.12	....	.....	...	.....

METALS.

	Mont'l.	Tor'to.
Lake copper	$16 50	$15 25
Electrolytic copper	16 25	15 25
Casting copper	16 25	15 10
Spelter	5 35	5 50
Tin	41 00	41 50
Lead	5.50	5.15
Antimony	8.50	9.00
Aluminum	22.00	18.00

SHEETS.

	Mont'l.	Tor'to.
Sheets, black, No. 28	$2.85	$2.90
Canada plates, ordinary, 52 sheets	2.90	3.00
Canada plates, all bright	4.00	4.15
Apollo brand, 10¾ oz. (American)	4.30	4.20
Queen's Head, 28 B.W.G.	4.40	4.40
Fleur-de-Lis, 28 B.W.G.	4.20	4.25
Gorbal's Best, No. 28	4.40	4.40
Viking metal, No. 28	4.40	4.40

MISCELLANEOUS.

	Cents
Putty, 100 lb. drums	$2.50
Red dry lead, 5 cwt. casks, per cwt.	6.00
Glue, French medal, per lb.	0.10
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.26
Benzine, per gal.	23½
Pure turpentine	0.60
Linseed oil, raw	0.60
Linseed oil, boiled	0.63
Plaster of Paris, per bbl.	2.10
Plumbers' Oakum, per 100 lbs.	3.25
Pure Manila rope	0.17

COKE AND COAL.

Solvay Foundry Coke	$5.95
Connellsville Foundry Coke	5.80
Yough, Steam Lump Coal	3.88
Penn. Steam Lump Coal	3.68
Best Slack	2.99

All net ton f.o.b. Toronto.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents.

Montreal, Nov. 10, 1913.—No great increase in trade activity can be recorded this week. The iron market still rules dull, and most large manufacturing firms are retrenching as much as possible. It is to be feared that there will be a considerable amount of unemployment during the coming winter; in fact, the number of men out of work even now is above the average.

Last week rumors were current of specifications about to be issued on behalf of the Grand Trunk Pacific. These have now been received and prove to be much more interesting than was thought likely. They call for machine tool and other equipment for the G. T. P. ship repairing plant at Prince Rupert, B.C., and the total amount of money involved will run to approximately $200,000. This is by far the most important specification that has been issued for a long time, and needless to say all the machinery houses are busy figuring on it.

The Union Switch and Signal Co., Swissvale, Pa., have just been awarded a contract for automatic block signalling equipment for the Intercolonial Railway. The contract price was $85,000, and calls for signals for the most congested parts of three important divisions on the line, viz., St. John to Hampton, N.B.; Moncton to Painsec Junction, N.B.; and Windsor Junction to Halifax, N.S. Another important contract recently secured by the Union Switch and Signal Co. involves the installation of automatic block signals across the Victoria Jubilee Bridge of the G. T. R. at Montreal. The Canadian office of the Company is in the Canadian Express Building, Montreal, at present; but it is stated that next spring a fully equipped factory will be erected in the vicinity of this city, and a Canadian Branch of the Company will then be organized.

Last week saw the formal incorporation of Armstrong, Whitworth, of Canada, Limited, with a capital of $2,000,000. This firm have for the last six months been going busily ahead with their new plant across the river at Longueuil. The twist drill shop and many of the other buildings are now covered in; but the equipment is not yet installed, and no manufacturing will be done until late in next spring.

Metal Market.

The pig iron situation remains unchanged. Sales are scarce in Canadian and American pig, and there seems to be no near prospect of any improvement. Copper to-day is quoted around $15.75 in New York, which means about $16.25 here. This price is not likely to hold for long, however, and the next few days may see a return to the $17.00 mark.

Tin is a little easier, but there is not much doing. Lead remains very firm owing to the great scarcity of this metal just now.

Toronto, Ont., Nov. 11, 1913.—With all the slackness that has been experienced in the machine tool business, there are some propositions that must go ahead, and there are new firms who must buy machine tools. The Kelsey Wheel Co., of Windsor, will probably buy Thursday or Friday. They are a new concern connected with the automobile industry.

One of the biggest orders for this class of machinery was placed this week, it is stated, with Mussens, Ltd.—an order that struck terror into the hearts of those who lost it. It was placed by the Dominion Dredging Co., who have the contract for constructing Section No. 1 of the Welland Canal. For this they have purchased steam shovels, excavators, dredges, etc., as well as a large number of machine tools, the order amounting to about $350,000. This order is said to have duplicated their entire equipment at Montreal. With other contractors on the Welland Canal ready to proceed, there should be several other big orders available pretty soon. Most dealers are getting after this business, which will be the best of the season.

The Michigan Central Railway, who recently erected new shops at St. Thomas, Ont., are purchasing several new machine tools. Their specifications this week call for three radial drills, wheel presses, and several milling machines.

The Canadian Fairbanks Morse Co. will exhibit a number of electrically-driven machine tools at the Electrical Exhibition this week in the Arena.

Steel and Iron.

Too much reliance should not be placed on the quotation for steel bars, f.o.b. Toronto, which is given as 2.15. This is the Canadian mill price, and is owing to the condition of trade just now.

While the price of steel bars quoted in Pittsburgh is 1.30, only very desirable business is being taken locally at that price. The price quoted for less desirable business is 1.35, of 1.88 f.o.b. Toronto. This is about the rate the U. S. Steel Corporation can do business at in this city, and the Canadian mills must compete with them at that rate. Complaints are made by Canadian steel companies that the price of steel bars is being cut by the Americans, and in consequence the Canadian price of 2.15 may be expected to drop considerably before long. The price 1.83 quoted above is, of course, on carload lots and over.

The charge of cutting prices is not only laid against American dealers. Some of the big jobbers in the city are said to be reducing their stocks of steel bars and plates preparatory to taking stock in December. An agent, speaking of this yesterday, said: "They are simply trying to 'kid' themselves that they have sold more than they have. They might as well have big stocks in January as in December."

Those who usually buy steel are playing a waiting game again. Some say the market will strengthen; some say it will weaken. As a matter of fact, the price of steel is getting about as low as it can be to be sold at a profit. Business conditions are resembling those of two years ago, beginning in December, 1911, and lasting until January, 1912, when makers of steel were cutting one another's throats. It is probable, however, that they will get together before then, and agree to stiffen prices.

The new American tariff is having its effect on the market more by keeping American buyers from placing orders rather than resulting in keen competition from Europe. As the prices here are based on those in the States, the reaction is felt in Canada. Buyers are looking to Germany to come along with some cheaper material.

Drummond McCall & Co. report more business done in October than in the earlier months this year. Warehouse business is heavy. They do not expect to carry pig iron again for several months. Pig prices remain the same. Little building is going on. The nut and bolt works of the Steel Company of Canada, at Swansea, are only working four days a week.

Metals.

Frankel Brothers report copper down a cent a pound, a drop which has been taking place gradually since Thursday last. They think the price will drop further. Why the price has fallen nobody seems to know; it may be due to manipulation or due to less demand. The English market is down, and New York has dropped in sympathy. No business is being done, however. Dealers are neither buying nor selling—just sitting on the fence, waiting to see what will happen. No. 1 machine composition is down to $11.50 from $12.50, the fall being natural, since 80 per cent. of it is copper.

Coke and Coal.

Local prices of coke remain unchanged. The supply is fair, and the demand, considering the state of trade, has been remarkably good. The fact that a coke plant is being built at Hamilton should not influence foundrymen, since it is probable that only furnace coke will be made to get the gas.

St. John, N.B., Nov. 8, 1913.—A new nail-making industry is to be established in St. John. The Canada Nail and Wire Co., Ltd., composed of several leading citizens, has been organized with a capital of $400,000 to manufacture horseshoe nails in a plant to be established at Coldbrook, not far from the automobile works. It is possible that operations will be commenced this year. The provisional directors are W. A. Johnston, R. L. Johnston, W. A. Coles, G. M. Johnston and F. E. Marvin.

F. H. Anson, president of the Atlantic Sugar Refineries, Ltd., was in the city yesterday from Montreal in company with E. G. M. Cape, contractor for the superstructure. Their visit had to do with plans to rush the work to completion, in addition to inspection of the work already done. Mr. Anson said that the difficulty of getting the structural steel on time, had caused a delay, but he expected most parts to be completed easily upon time. Every possible effort would be made he said to have the building rushed to completion.

An event of much importance in the industrial history of St. John, was the announcement made this week by J. A. Pugsley, general manager of the Maritime Motor Car Co. prior to his departure for England, that the Ford Motor Co. intend coming to this city and would locate at Coldbrook. Negotiations for the lease of the big plant of the Maritime Motor Co., at Coldbrook have been in progress for some time, and various rumors have been received with interest, but an official announcement was not made until this week that the deal had gone through.

Mr. Pugsley said that plans would immediately be prepared for a new factory for the Maritime Motor Co. in the spring which is another announcement of leading importance. Until this is completed, he said the company would continue to ship their cars from the American factory of the Palmer & Singer Mfg., at Long Island City, N.Y., with which Company he said his concern had become affiliated. Mr. Pugsley also said that he and Malcolm Mackay, jr., were intending to leave at once for England, and upon their return, he hoped to be able to announce the coming of more English and Canadian industrial concerns to St. John.

A modern electric lighting system has just been completed and installed at Grand Falls, N.B. The town has erected a large concrete sub-station, and has installed an electric pump in connection with the water-works system to replace the steam pump which was not considered of sufficient power. The power is supplied by the Main & New Brunswick Electrical Power Co., whose power house is at Aroostook, Falls, N.B.

The drilling operations for natural gas at Sussex, in progress by the Maritime Oilfields Co., has been abandoned until the spring, when work will be resumed. The company reached a point twelve hundred feet down, and it is expected that another three hundred feet will show a good flow of gas. The indications are encouraging, but the drillers and other employes of the company engaged at Sussex, are needed at Stoney Creek, near Moncton, N.B., where the gas boring is more extensively developed.

EXPENDITURES AT CANADIAN PORTS.

THE Public Works Department will call for tenders in a few days for the construction of concrete piers at Victoria, B.C., to cost $2,000,000. This is another step towards the Nationalization of Canadian Ports on which the Government is now spending money by the tens of millions. The new piers at Victoria will be constructed in the outer harbor, within a shielding breakwater, and the work as now planned, aggregating a total expenditure of over $5,000,000, will provide for the growing shipping of the port for years to come.

Millions are being spent also on Vancouver harbor, besides some $700,000 on the dredging of False Creek within the harbor. At Esquimalt also the Government purposes building a huge drydock 1,150 feet long, similar to that at Levis for which the Prime Minister last Friday turned the first sod.

Other Big Expenditures.

Other immense Federal Expenditures on ports include the Toronto harbor improvements, costing $5,000,000, and the contracts recently awarded for three sections of the new Welland Canal. These total about $19,000,000, or a third of the total cost of the Canal.

Besides the important improvements planned at Montreal harbor, costly works are being undertaken also at Quebec, both by the Public Works and Railway Departments.

St. John and Halifax.

At St. John, N.B., improvements are now under way that will total about $30,000,000, while at Halifax the terminal works to be built by the Department of Railways and Canals will cost probably $15,000,000 or $20,000,000, including the docks, three miles of railway, necessary buildings, etc. Saturday was the last day for receiving tenders for the first unit of these vast improvements.

Pigeon, Pigeon & Davis, patent solicitors, St. James Street, Montreal, report that 165 Canadian patents were issued for the week ending October 28th, 1913, 100 of which were granted to Americans, 35 to Canadians, 18 to residents of foreign countries, and 12 to residents of Great Britain and colonies. Of the Canadians who received patents, 19 were residents of Ontario, 8 of British Columbia, 4 of Quebec, 1 of New Brunswick, 1 of Manitoba, 1 of Saskatchewan, and 1 of Alberta. In the United States, for the same week, 590 patents were issued, 16 of which were granted to Canadian inventors.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Engineering

Hamilton, Ont.—The Boston Insulated Wire Co., Shaw Street, are planning a $5,000 addition to their plant.

Milton, Ont.—The Imperial Foundry Co. new building near the C. P. R. station is ready for the roof.

Sarnia, Ont.—Harry W. Loughead has purchased property on North Front Street for an extension to his machine shop. New machinery has been bought.

Saskatoon, Sask.—The Metal Shingle and Siding Co., of Saskatoon, Ltd., has been incorporated at Regina, with $500,000 capital.

Walkerton, Ont.—Work has begun on the foundry and repair shop, one storey, 40 x 50, for Ellenhauser Bros., to cost $5,000.

Windsor, Ont.—The No Draught Ventilator Co., of which E. J. Post, Staunton, Va., is secretary, will erect a factory here.

Windsor, Ont.—Construction work on the plant of the Swedish Crucible Steel Co. has been delayed owing to difficulty in obtaining a supply of steel.

Toronto, Ont.—The Pedlar People of Oshawa, Ont., have secured a 10 years' lease on the basement floor of the new Art Tailoring Building on Markham and College Streets.

Selkirk, Man.—The Manitoba Rolling Mills Co., who are erecting a plant here, are taking 50 h.p. from the municipal plant, and will take 400 h.p. when the plant is finished.

Fort Erie, Ont.—D. J. Johnson is acting for the motor car firm who propose to erect a plant here. He is also trying to induce some makers of metal office furniture to locate.

Vancouver, B.C.—George Wolf, jun., of the Geo. Wolf & Son Steel Mfg. Co., Bathgate, Scotland, who have a branch in Montreal, says his firm may extend their operations to Western Canada.

St. Catharines, Ont.—The Dominion Dredging Co., Ltd., announce they are erecting a machine shop, using their own labor, and have purchased all necessary machinery. E. A. Larmonth is manager.

Toronto, Ont.—The Consumers' Gas Co., of Toronto, inform us that plans for the enlargement of their works have not yet been completed. Edward Jackman is purchasing agent.

Smith's Falls, Ont.—An automobile firm through A. B. Scott, of the Board of Trade, have asked the town to rent the Tudhope-Anderson works, and give it to them rent free for a few years. On these conditions they would move to Smith's Falls.

Toronto, Ont.—The Rock & Power Machinery, Ltd., has been incorporated at Ottawa, with capital of $500,000, to manufacture machinery of all kinds, and to act as agents for same. Incorporators—Allan Gilmour, Archibald Cochrane, barristers, Toronto.

Victoriaville, Que. — La Compagnie Jutras, Ltd., incorporated at Ottawa, capital $100,000, to manufacture manure spreaders, maple sugar evaporators, and farming implements. Incorporators—Charles B. Jutras, Woodward Jutras, etc.

Hull, Que.—The Hull Iron & Steel Foundries, Ltd., have been incorporated at Ottawa, with capital $250,000, to acquire and take over as a going concern the undertaking and business now carried on at the city of Ottawa by A. H. Coplan as brass and steel founders.

Regina, Sask.—The Norris Burnett Co., of Potowski, Mich., wish to move their machine shops here. If given financial assistance they will build a shop 40 x 50 ft., two storeys high, and employ 20 men.

Ottawa, Ont.—The Campbell Steel & Iron Works, Ltd., makers of structural steel, boilers, tanks, etc., have commenced work on an addition to their plant, which will double their capacity. All machinery has been purchased.

Le Pas, Man.—Next spring work will start on the roundhouse and machine shops for the Hudson Bay Railway, plans for which have been prepared. The location of the station has not yet been determined. It is said $75,000 will be spent on this building, which is to be completed by January 1, 1915.

Medicine Hat, Alta.—The third annual meeting of the Alberta Rolling Mills, Ltd., was held on November 3. It was decided to go ahead with the erection of the bolt plant here. About a million dollars will be spent on this building, which will measure 70 x 150 ft. J. L. Pollock is president.

St. John, N.B.—The Canada Nail and Wire Co., Ltd., has been incorporated in New Brunswick, with head office in St. John, to make wire, wire nails, spikes, screws, bolts, tacks, etc., with $400,000 capital. Provisional directors are:—Wm. A. Johnston, St. John; Robt. L. Johnston, Gordon McR. Johnston, and Frederick E. Marvin, nail maker.

Calgary, Alta.—The North-Western Brass Co., Ltd., East Calgary, have completed a foundry, 200 x 100 ft., and started operations. There are twenty furnaces, served by car tracks. The other departments are pattern room, core ovens, machine shop and assembling room. The plant cost $250,000. A. G. Meaden is manager.

Montreal, Que.—The management of the Canadian Vickers Co. report that the foundations of the new shipbuilding slipway at the site of the floating shipdock at Maisonneuve have been laid. The structural work for the slipway, which will be 390 feet wide over all, is now in process of construction at the works of the Dominion Bridge Co.

Lindsay, Ont.—The Canadian Boving Co. have started work on the foundations for an extension to their machine shop. The building will be completed before winter sets in. The Company have purchased some machine tools, but have not yet bought the full equipment. Specifications for cranes were considered last week.

Winnipeg, Man. — Henry Birks & Sons, Ltd., and the Porto and Marble Co., jewelry manufacturers, who have amalgamated, will establish a jewelry factory here, and instal die presses, drop hammers, machinery for drilling and turning, smelting furnaces for assaying and refinishing, draw benches for making gold and platinum wire, etc.

Winnipeg, Man.—A corporation, capitalized at $1,000,000, has been organized here for the manufacture and sale of the Bull tractor, a general utility gasoline tractor on three wheels, which will sell for $485. The officers are:—W. H. McWilliams, president; Alex. R. Hargraft, vice-president, and J. S. Lowden, secretary. D. S. Hartsough, of Minneapolis, inventor, and patentee, is understood to have taken a large block of the stock.

Montreal, Que.—The Canadian branch of the Armstrong-Whitworth Co., one of the great shipbuilding concerns of Britain, has been incorporated at Ottawa, preparatory to the commencement of operations in this country. The incorporators named are Sir Percy Girouard, K.C.M.G.; Sir George Herbert Murray, C.B.; Sexton William Armstrong Noble, George G. Foster, K.C.; John A. Mann, K.C., and M. J. Butler, C.M.G. The capital is placed at $2,000,000.

Electrical

Brockville, Ont.—The town will spend $69,000 to extend the light and power systems.

Fonthill, Ont.—Arrangements are being made to have the village lighted by electricity.

Fergus, Ont.—The village will borrow $10,000 to establish a local distributing plant to utilize hydro power.

Fergus, Ont.—This village will spend $16,000 on Hydro-Electric power, and the village of Elora, Ont., will take 200 h.p. and spend $10,000.

Regina, Sask.—The Estevan Transit and Power Co., Ltd., will apply for incorporation in Saskatchewan as a power and railway company.

Smith's Falls, Ont.—The council have decided to ask the Hydro-Electric Commission to develop power from Long Rapids on the Madawaska River, and transmit it to Smith's Falls.

Brantford, Ont.—Engineer J. J. Jeffery of the Ontario Hydro Commission has been inspecting Parkdale, Grandview, Echo Place and Paris Hill in response to the petitions from these places for electric energy.

Grand Falls, N.B.—The town has just completed the installation of an electric lighting system. Power is supplied by the Maine & New Brunswick Electrical Power Co., whose power house is at Aroostook Falls, N.B.

Galt, Ont.—Three more transformers have been placed in the Dickson Street hydro sub-station, making six there, and, with three in the Getty & Scott sub-station, Galt has now a transformer capacity of 1,800 horsepower.

London, Ont.—The London Street Railway has signed a contract with the City of London and the Hydro-Electric Commission of Ontario for from 1,000 to 3,000 h.p. to operate its lines. The company will use direct current.

Mirror Lake, B.C.—The Mirror Lake Electric Light Co., Ltd., have installed a light and power plant here. The equipment purchased consisted of an Edison 35 k.w. 110-volt generator and attachments. The wiring and other work were done by W. R. Godfrey of the McKenzie Electric Co., Lethbridge.

The Rudel-Belnap Machinery Co. have located their Toronto office at Room 10, Tanner & Gates Bldg., 28 Adelaide St., West. Mill, mining, machine shop, railway and contractors' machinery and equipment will be sold from the Toronto office, which is in charge of Mr. A. E. Jubler.

Toronto, Ont. — The contract to sell the T. Eaton Co. 2,500 horse-power per annum represents one of the biggest individual contracts yet signed by the Toronto Hydro-electric Commission. The cost to the company will be in the neighborhood of $30,000 per annum, and the Commission states that it will have to increase its supply from the Ontario Power Commission in order to cope with the increased demand.

General Industrial

Irvine, Alta.—The Ogilvie Milling Co. elevator at Irvine was burned Oct. 31.

Wilkie, Sask.—F. L. Bishop, Strome, Alta., will erect a flour mill, costing $10,000.

Winnipeg, Man.—The Provincial Government will spend $2,500,000 on good roads in this province.

Victoria, B.C.—The British Columbia Gypsum Co., Ltd., have been incorporated here to work this product.

Toronto, Ont.—W. Harland & Son, 400 Eastern Avenue, will erect a $6,000 plant for the manufacture of varnishes.

Sherbrooke, Que.—A Levis shoe manufacturing Company, employing 154 hands, will move here if given a $15,000 bonus.

Porcupine, Ont.—Twenty more stamps will be installed at the Hollinger Mine next spring, and the new central power plant will be pushed.

Windsor, Ont.—The American Chemical Co., of Cincinnati, Ohio, will establish a Canadian branch at Ford to handle North-West trade.

Saskatoon, Sask.—The Saskatoon Soap Co. will erect a new soap plant to make new lines. J. J. Manly is business manager.

Lake Megantic, Que.—Local farmers will organize a Co-operative Creamery Association and advertise for the building of a creamery in the Echo Vale district.

Clayburn, B.C.—The milk factory here is completed, and in the course of a couple of weeks the machinery will be installed. Another plant will probably be built by the same firm near Duncan. Vancouver Island.

Toronto, Ont.—The McBrien Leather Goods Co., of Berlin, have purchased for $25,000 the factory at 80 Duchess Street. The building is three storeys, with a frontage of 39 feet, by a depth of 100 feet.

New Westminster, B.C.—The Grain Growers' Grain Co., of Winnipeg, have purchased the elevator and business of the Grain Growers' B.C. agency here, and will probably extend it. C. B. McAllister is local manager.

New Westminster, B.C.—The Grinnell Glove Co., of Vancouver, has decided to establish a glove and leather goods factory at the corner of Mars Street and Wilson Road, Port Coquitlam; work to start at once.

Bridgeburg, Ont. — The Standard Crushed Stone Co., of Niagara Falls, will open up a 72-acre quarry at Windmill Point, near here, next spring, employing 50 men. Sims & Doyle, Queenston, Ont., will also open a quarry in the same vicinity.

Victoria, B.C.—The erection of a laundry at Kitsilano Beach in connection with the Park Board's system of bath houses will cost $3,400, according to a detailed estimate of the proposed building submitted to the finance committee of the City Council. The building will cost $1,400 and the equipment $2,000.

Sarnia, Ont.—An Elevator Company, desirous of operating a large grain elevator at Sarnia or Point Edward, has written to Sarnia requesting information as to whether any inducements will be offered for location there. The Company has had an offer to build at another point, where there is an advantage in power and a low rate of taxation.

Niagara Falls, Ont.—The American Cyanamid Co. has been employing 650 men in operating its plant and 450 in building extensions. The new buildings include, besides duplications of the present process buildings, new offices, wash-house, laboratory, restaurant, hospital and a liquid air plant. The new plant will have a capacity of 60,000 tons per annum.

Building Notes

Oakville, Ont.—The town hall was completely destroyed by fire on Nov. 4.

Wood-Working

Leadville, Que.—C. N. Boright, Mansonville, is planning the erection of a saw mill.

Ridgeway, Ont.—Frank Sherk is building a planing mill on the Alex. Hann farm.

Fort Qu'Appelle, Sask.—The Fort Qu'Appelle Boat Building and Woodworking Co. is building a factory at a cost of about $50,000.

Royal Oak, B.C.—The shingle mill belonging to G. Fleming & Yeomans, Royal Oak, was destroyed by fire recently. The mill had only been in operation four months.

Westmount, Que.—R. T. Smith & Co., Hillsdale Avenue, Westmount, suffered loss by fire at their sash and door factory recently. The damage amounted to about $25,000.

Wyoming, Ont.—Preliminary work for the building of the box and basket factory by D. Senecal was commenced last week. The size of the factory will be 30 x 120 feet.

New Liskeard, Ont.—The National Pole Co., of Escanaba, Mich., have purchased seven acres for a plant to employ twenty-five men. The Company will erect a shingle mill later.

Vancouver, B.C.—The Everett Pulp & Paper Co. has been incorporated in British Columbia with head offices here. The capital stock is $672,000. The Company intend to erect a pulp and paper mill in British Columbia.

Quebec, Que.—The Beauce Pulp and Lumber Co., 68 Peter Street, Quebec, are considering plans for building a new mill at Scott Junction, P.Q., to replace the one which was recently destroyed by fire.

Brantford, Ont.—The Ham & Nott Co., Ltd., makers of refrigerators, screen doors, etc., have recently increased their warehouse space, and installed new machinery and boilers, at a cost of $10,000 to $15,000.

Stratford, Ont.—G. H. Strawbridge has purchased the carriage works at 134 Ontario Street. He will make furniture to order, and do band sawing, pattern making, and general repair work. New machinery has been purchased.

Chicoutimi, Que.—The British Industrial Co., owners of large timber limits on the Salmon River, intend to erect a large paper mill in the Lake St. John district, Quebec. The plant will be located on the Ashuapmouchouan River.

Stratford, Ont.—The City Council is considering a proposition from the Stratford Manufacturing Co. to practically double the size of its plant. The firm, which makes lawn swings, ladders, etc., asks the council to grant fixed assessment of $6,000 for ten years.

Montreal, Que.—The Chicoutimi Pulp Co. have been authorized to increase their capital stock to $1,500,000 from $1,000,000, but J. E. A. Dubuc, managing director, declares that no immediate extensions are contemplated. The Company has orders on its books to the value of $16,000,000, covering the output of the mills for eight years.

Morin Heights, Que.—The mills of the Argenteuil Lumber Co. have been totally destroyed by fire. The Company manufactured clapboards, shingles and lath. A small electric plant which supplied the district and mills with power and light was also destroyed. The damage is estimated at $30,000 with $10,000 insurance.

Dryden, Ont.—A meeting of the creditors of the Dryden Timber & Power Co. was held recently in Toronto, at which D. L. Mather, of Winnipeg, President of the Company, was appointed liquidator. It is reported that the Company will be reorganized and that the liquidator was authorized to borrow $200,000 to continue operations. J. B. Beveridge will continue as manager.

Contracts Awarded

Welland, Ont.—The contract for the basement of the R. C. Church, to cost altogether $50,000, has been let to J. H. Gardner for $9,955.

Ottawa, Ont.—A contract has been awarded the John Inglis Co., Toronto, by the Dominion Government for the construction of 13 submarine bell floats at $6,370.

Grand Forks, B.C.—The contract for the erection of the building of the Grand Forks Canning Co. was let recently to Angus McDougall, his tender being $11,000.

Victoria, B.C.—Evans, Coleman & Evans have secured the contract from the city for 550 tons of steel rails for the light railway to be built in connection with the Sooke waterworks.

New Incorporations

British Manufacturers' Association of Canada, Ltd., incorporated at Ottawa, capital $10,000, to carry on the business of electrical or mechanical engineers, at Montreal.

The Roger Miller & Co., Ltd., incorporated at Ottawa, capital $200,000, to carry on business relative to the construction and erection of public and private works, buildings, etc., at Montreal.

The J. H. Tromanhauser Co., Ltd., incorporated at Ottawa, capital $100,000, to carry on the business of engineers, architects, and builders, at Toronto. Incorporators: John F. Boland, Frederic J. Boland, etc., Toronto.

Morris Construction Co., Ltd., incorporated at Ottawa, capital $100,000, to build public or private works of every kind and description at Ottawa. Incorporators: Kenneth A. Morrison, Thomas A. Burgess, etc., Ottawa.

The Lumsden Lumber Co., Ltd., incorporated at Ottawa, capital $500,000, to carry on the business of saw-mill proprietors, at Ottawa. Incorporators: William White, Leigh M. Farson, etc., Ottawa.

Canadian Specialties Mfg. Co., Ltd., incorporated at Ottawa, capital $1,000,000, to manufacture machinery and apparatus, at Toronto. Incorporators: James S. Lovell, William Bain, etc., Toronto.

Ste. Agathe Lumber and Construction Co., Ltd., incorporated at Ottawa, capital $300,000, to operate saw, shingle, bark and pulp mills and other works for the manufacture of wood and all products of wood.

Temiskaming Automobile & Supplies, Ltd., incorporated at Toronto, capital $40,000, to manufacture and otherwise deal in motor vehicles and boats of all kinds, at Cobalt. Incorporators: Charles J. Frederick Collier, Arthur B. Mortimer, etc., Toronto.

Lake Superior Dry-Dock and Construction Co., Ltd., incorporated at Toronto, capital $1,000,000, to build, erect, construct, steamships, at Sault Ste. Marie. Incorporators: James S. Lovell, Robert Gowans, etc., Toronto.

Winnipeg River Power Co., Ltd., incorporated at Ottawa, capital $1,000,000, to acquire and operate water powers and water privileges and other works for the generation of electricity, at Winnipeg. Incorporators: Ernest Frith, Charles W. Chappell, etc., Winnipeg.

E. G. M. Cape & Co,, Ltd., incorporated at Ottawa, capital $500,000, to carry on the business of general contractors and engineers for the construction, erection, repair or alteration of public works, at Montreal. Incorporators: Lawrence Macfarlane, Charles A. Pope, etc., Montreal.

Tenders

Regina, Sask.—The Regina Plumbing & Heating Co. have offered to instal a heating and ventilating plant in the General Hospital for $42,460.

Ottawa, Ont.—Ten tenders for plans have been received for the proposed new Government-owned elevator to be built at Port Nelson. The tenders have all been sent west to be considered by the Grain Commissioner.

Winnipeg, Man.—Tenders will be received up to December 1st,, 1913, for the supply of D. C. and A. C. Meters, as may be required by the City Light & Power Department, during one year from the date of contract. M. Peterson, secretary, Board of Control Office, Winnipeg.

Ottawa, Ont.—Tenders will be received at the Department of the Interior up to December 1, for the furnishing of 15,000 small and 500 large iron posts for use on the survey of Dominion Lands to be delivered at Edmonton on or before the 31st day of January, 1914. L. Pereira, secretary.

Municipal

Eastview, Ont.—The town council will spend $10,000 on fire engine, station, etc.

West Vancouver, B.C.—The ratepayers have voted $40,000 for a wharf at Dundarave.

Oak Bay, B.C.—The municipal council will purchase water mains for a waterworks system.

Ottawa ratepayers will decide next January whether to continue its publicity bureau or not.

Vancouver, B.C.—Plans are now being prepared for $5,000,000 worth of new civic work for next year.

Sudbury, Ont.—The ratepayers will be asked to vote $8,606 for extension to the power house pumping station.

London, Ont.—The Board of Education have asked the city council to spend $35,000 on a new technical school.

Winnipeg, Man.—The Motor Transit Co. is asking the city for a five-year franchise. A. J. Andrews K.C., represents them.

Woodstock, Ont.—A by-law before the ratepayers on November 6 to lend $12,000 to the Fort Wayne Oil Tank & Pump Co. was carried.

Toronto, Ont.—Plans for widening Yonge St. have been approved by the Civic Works Committee. The work will cost over two millions.

Ingersoll, Ont.—Engineer F. W. Thorold, of Toronto, has submitted to the council plans of a sewage system, the estimated cost of which is $59,000.

Dundas, Ont.—The town council will build a sewage disposal works, and try to obtain a water supply from Lake Ontario in conjunction with Hamilton.

Lennoxville, Que.—The Lennoxville Waterworks Co., through its superintendent, N. H. Greene, has offered to sell the waterworks to the town for $34,000.

Stratford, Ont.—The citizens have voted against the city guaranteeing the bonds of the Avon Hosiery Co., and against purchasing additional fire apparatus.

London, Ont.—The Ontario Railway and Municipal Board has dismissed the application of Swift-Greene, Limited, of London, to lay steam pipes across Carling Street for the purpose of supplying buildings with heat.

Welland, Ont.—The old waterworks plant is being repaired at a cost of $500, and will be used as an auxiliary in the event of a breakdown at the new plant.

London, Ont.—Willis Chipman, of Toronto, and city engineer W. N. Ashplant, last week outlined before the council a program for carrying the $400,000 storm sewer project through.

Medicine Hat, Alta.—The city will submit by-laws authorizing the expenditure of the following sums: $175,000 on a waterworks system; $60,000 on storm sewers; $12,000 on additional fire apparatus; $50,000 for repairs to roads and purchase of road construction plant and machinery; $150,000 for increasing and extending electric light; and $50,000 for drilling gas wells.

Marine

Toronto, Ont.—Polson Iron Works have sent 25 men to Nelson, B.C., to erect the car float built by them for the C.P.R.

Sault Ste. Marie, Ont.—The Company arranging to build a dry dock here, have deposited their $25,000 guarantee. A by-law will be passed later to give the company a bonus of $20,000 a year for 20 years.

Canadian Canal Traffic.—October statistics on Canada's Canals give the traffic total as 39,077,369 tons, which is 4,816,103 tons greater than in the same month of 1912. The increase at the Soo was 3,467,889, the Welland 673,359, and the St. Lawrence 744,835. The figures indicate that much traffic passing through the Canadian Soo reaches the seaboard via American routes.

St. Catharines, Ont.—Final arrangements are being made by Baldry, Yerburgh & Hutchinson, contractors for No. 2 section of the Welland Canal. Mr. Rigby has been in Toronto in this connection.

Refrigeration

Brantford, Ont.—The Brantford Ice Co. have decided to erect an ice manufacturing plant at a cost of about $45,000.

Westmount, Que.—The Centerfreeze Sanitary Ice Co., Merchants Bank Building, Montreal, is contemplating the erection of an artificial ice plant here.

Winnipeg, Man.—Premier Roblin, of Manitoba, says the Government will erect a public abattoir at the new Union Stock Yards here, to encourage live stock industries.

Railways - Bridges

Victoria, B.C.—The C.N.R. will, it is believed, extend its line to Alberni, north of the island.

Owen Sound, Ont.—Mayor Lemon and others have asked Sir Jas. Whitney to aid in building a line between Owen Sound and Meaford.

Halifax, N.S.—The Halifax Tramways Co. has been empowered to issue 6,000 shares of ordinary stock, part of which will be used for extension work.

Sherbrooke, Que.—P. J. Wolfe, Sherbrooke, has the contract for ten miles of extension on the Quebec Central Railway from St. Sabine to St. Pamphile. Mr. Morkill, chief engineer, Sherbrooke.

Galt, Ont.—The terminal facilities of the Lake Erie and Northern Railway at Galt are being made ready. It is expected that the work will be finished this year.

Brantford, Ont.—The rumor is renewed that Mackenzie and Mann, are anxious to get into Brantford. It is alleged that they have made some propositions with reference to the Lake Erie and Northern Railway.

Ottawa, Ont.—The Ontario Lake Front Terminal Railway is applying to Parliament for authority to construct a branch railway from Havelock, on the C.P.R., via Campbellford, to Cobourg and Brighton.

Eastview, Ont.—J. D. Fraser, sec.-treas. of the Ottawa Electric Railway, has informed the council that it cannot extend its lines to Eastview owing to the shortness of the company's franchise.

Ottawa, Ont.—J. D. McArthur, who has the contract for the Hudson Bay Railway from Le Pas to Port Nelson, announces that he has graded over 150 out of 400 miles, and before the season closes, steel will be laid on 130 miles of grade.

Ottawa, Ont.—Pringle and Guthrie, solicitors, give notice of application to Parliament for a charter for the Central Canada Railway Co., with power to conduct and operate a railway from Winnipeg to Edmonton via Yorkton, Sask., and Battleford.

Nelson, B.C.—The City Council and directors of the Street Railway Company have agreed on municipal operation of the line, with the stockholders retaining their interest. To give the city control the number of shares will be increased by 25,000.

Toronto, Ont.—Plans are being prepared for the construction of the Forest Hill Railway in York township, and will be submitted to the Township Council for approval. By the charter, the company is required to spend at least $50,000 within the first year.

Vancouver, B.C.—Sir Richard McBride says he has been assured by Alfred Smithers, head of the G.T.P., that the line from Edmonton to Prince Rupert would be finished by midsummer, next year. He has received similar assurances concerning the C.N.R. from Sir William Mackenzie.

Vancouver, B.C.—It is reported that Sir Richard McBride has concluded a deal with the Standard Oil Co. to give them a charter at the coming session of the Provincial Legislature to build a railway through to Alaska. This line will run in connection with the Chicago, Milwaukee & St. Paul Railway, with headquarters at Seattle, linking the Pacific Great Eastern with Fort George.

Trade Gossip

Miller, Limited, have changed their name to The Dominion Brass Corporation, Ltd.

The name of the **Lyon Gas Saving Co., Ltd.,** has been changed to The Solex Co., Ltd.

The Hudson Bay Co. have issued $5,000,000 new stock for expansion of the store business.

Fort William City Council will engage an electrical inspector, who will have power to appoint assistants.

The Boake Mfg. Co., Ltd., lumber and timber merchants, Toronto, will increase their capital stock from $60,000 to $300,000, and extend their business.

The Preston Car & Coach Co., Ltd., have been authorized to create and convert $100,000 of unissued common capital stock into $100,000 preference stock.

The International Engineering Works, Ltd., of Amherst, N.S., have recently opened three new offices in addition to their regular offices at Montreal, Toronto, etc. These and the representatives are: George M. Taylor, 816 Burrards St., Vancouver, B.C.; J. F. Tracey, 321 Edmonton St., Winnipeg, Man.; and Grodwards Co., Cobalt., Ont.

T. W. Kirby, of the Hamilton Stove and Heater Co., has been elected president of Kir-Benn, Limited, a new stove and furnace Company at Almonte, Ont. William Thoburn, M.P., and J. E. Bennett, Toronto, were elected vice-presidents. Other directors are: T. R. White, A. G. Rosamond, F. W. Robertson, and W. H. Stafford, all of Almonte.

W. W. Butler, vice-president of the Canadian Car and Foundry Company, is interested in the flotation of a new company to be known as the W. W. Butler Co., Ltd. The new company has already taken out papers of organization, and will be capitalized at $100,000. Its business will be to deal in general mill and engineering supplies, car details, power boating accessories, etc. It is stated that Mr. Butler will not resign from the Canadian Car and Foundry Co.

Kilmer, Pullen & Burnham, Toronto, have been awarded a contract by the city of Prince Albert, Sask., for two vertical type generators, 1875 K.V.A. each, 2,200 volts, 3-phase, 60 cycles, 138 r.p.m., and two vertical type exciters, 150 k.w. each, at 300 r.p.m., all made by the Swedish General Electric Co. These are to be used in the power house at LaColle Falls, the development of which has been held up for financial reasons.

J. H. Rodgers and W. J. Spence, foremen in the press room of the E. T. Wright Co., Hamilton, Ont., have recently invented a tripping device for power presses which prevents repeating, and thereby minimizes the risk of loss of fingers by operators in stamping or press rooms generally. A description of this apparatus appeared in Canadian Machinery some months ago, and we are informed that a patent covering Canada and the United States has now been secured by the joint patentees.

The Garlock Packing Co., Hamilton, Ont., have opened a branch at Calgary, Alta., where a stock of packings will be carried. This branch is under the managership of J. T. Dohm, who is well known in British Columbia and Alberta. L. G. Hargreaves, of the Garlock Western staff, has been appointed Winnipeg branch manager, and W. B. Powell will represent the company in Manitoba and Saskatchewan. The Garlock Co. now have branches in Montreal, Toronto, Winnipeg, and Calgary.

Canadian General Electric Contract.—The town of Aurora, Ont., has decided to instal an equipment of motor driven turbine pumps for protection against fire. It will include two four-stage high lift turbine pumps of Mather & Platt design, built by Canadian Allis-Chalmers, Ltd. Each of these fire pumps will be capable of delivering 400 Imperial gallons per minute, against a total head of 325 feet, when operating at 1,460 r.p.m. They will be direct connected at one end to an alternating current motor, and at the other end to a direct current motor in order to conform with the underwriters' requirements that there must be two distinct sources of power for this purpose. The electrical apparatus, including a four panel switchboard, will be built by the Canadian General Electric Co., Ltd.

Canadian General Electric Contracts.—The new G. T. P. floating dry dock at Prince Rupert, B.C., will be one of the largest and best supplied in the world, and will be electrically operated throughout. The contract for the electrical equipment, which has been awarded by the G. T. P. to the Canadian General Electric Co., Ltd., includes two 200 h.p. and four 100 h.p. variable speed induction motors, with full automatic control, for operating the pumps on the dock. The power will be produced by two 1,250 K.V.A. Curtis steam turbines, with complete condensing apparatus. The exciters for the main turbine-generators will consist of three 35 K.W. turbine driven generators and one motor generator set. The foundry, machine shops, and shipyards will be equipped with motor driven tools, requiring motors ranging from 60 to 10 h.p. The contract for electrical equipment also includes all necessary power and light transformers.

Catalogues

Canadian Steel Foundries, Ltd., Montreal, have favored us with a copy of their Catalogue No. 6, which describes the Jackson railroad switch stand. The special features of this "rigid" stand are clearly set forth, the description being amplified by excellent half-tone cuts.

Bulletin A. 4134 has been issued by the Canadian General Electric Co., Toronto, and deals with apparatus for drying and filtering transformed oil and

Considerations Relative to Gears for Machine Tool Drives*

By John Parker

This paper deals with the important subject of selecting the proper material for gears in accordance with the best modern machine-tool practice. The method of heat treating and hardening gears is fully explained, and the proper hardness by the scleroscope test for the different stages is given.

THE basis of this paper is the consideration of the following six questions relating to the use of gears for driving machine tools:

1—Under what conditions is it advisable to use cast-iron or steel gears for machine-tool drives?

2—Are the objections to cast-iron on the ground of wear or breakage?

3—What tooth pressure is safe for cast-iron gears?

4—What grades of steel gives best results and how should they be treated?

5—How hard is it advisable to make steel gears before machining them?

6—Are they to be hardened after machining, and if so, to what scleroscope test?

Cast Iron Gears.

There are a number of well established gear conditions that are common to the majority of machine tools, which if noted may prove somewhat of a guide in selecting the proper material for the gears, considered from the standpoints of economy, efficiency, and durability. The conditions may be classified, as in the accompanying table.

The objections to cast iron cover both wear and breakage. If the speed is excessive, say about 500 ft. per minute, they are likely to wear quite rapidly; and on slow speeds and heavy pressure, breakage will occur, unless they can be made of adequate size, as in the case (E), where the back gears are so located in the machine that it is possible to employ large diameters, coarse pitches and wide faces.

The question of tooth pressures in cast-iron gears is somewhat problematical. The Brown & Sharpe Mfg. Co. have in successful operation a gear in the spindle drive of their largest milling machine made from a hard, close-grained cast iron having a tensile strength of 23,000 lb. per sq. in., which when running at the slowest speed sustains a pressure on the teeth of 8,250 lb. It is calculated that two teeth are always in contact, which gives 4,125 lb. pressure per tooth. The area in cross-section of each tooth is 1¼ sq. in., equaling 3,300 lb. per sq. in.; when the gear runs at the fastest speed the pressure is about 1,000 lb. per sq. in. It is not known whether the pressure could be increased to any considerable extent, but it has been overloaded to at least 30 per cent. without injury; this was when testing out the machine, and the overload was of short duration. It might be said that this gear is not subjected to any sudden shock; if it were, the allowable tooth pressure would be considerably less.

Steel Gears.

For gears that are of small proportions and yet are subjected to heavy duty, it has been found that in cases where the more common steels have failed, excellent results have been obtained from using a 5 per cent nickel steel. This steel casehardens with a very hard surface and still has a strong and tough core, making it an ideal steel to use where the pressure is heavy or the gear is subjected to shock. Experience shows that drop forgings are more uniform in texture than bar stock. This grade of

Gear Conditions Common in Machine Tools.

(A)—Gears always in mesh, the wear on the teeth being constant.	(a)—Slow speeds, light duty	Cast iron.
	(b)—Slow speeds, heavy duty	Machinery steel.
	(c)—Fast speeds, light duty	Machinery steel.
	(d)—Fast speeds, heavy duty.	Machinery steel, casehardened.
(B)—Gears in sets that are removable and interchangeable with each other, distributing the wear over a number of gears.	These are change gears used in thread cutting on lathes, spiral cutting on milling machines, indexing on automatic gear cutters and feed and speed change gears; speeds and pressures are generally moderate.	Cast iron, excepting the smallest, which may require to be of steel.
(C)—Gears in sets that are non-removable and partially interchangeable, distributing the wear over a number of gears. Changes made while gears are in motion[1]	Used as quick-change feed gears — changes made by levers; high speeds and heavy pressure.	Machinery steel, casehardened.
(D)—Gears in sets that are non-removable and partially interchangeable, distributing the wear over a number of gears. Changes made when gears are at rest[2]	Used as quick-change feed gears — changes made by levers; high speeds and heavy pressure.	Machinery steel, casehardened.
(E)—Gears that are employed only part of the time the machine is working, and are engaged and disengaged when the machine is stopped.	This condition applies to back gears for the spindle drive. Gears are made large diameter, coarse pitch and wide face; speeds moderate and heavy pressure.	Hard, close-grained cast iron.

(1) If the changes were made when the machine was at rest, the gears would not require hardening. But custom demands that changes be made while the machine is running.

(2) Although the changes are supposed to be made when gears are at rest, careless workmen will violate this rule, with the possibility of breaking the engaging gears. Some makers use an alloy steel in their spindle train to prevent breakage, but a better way is to provide means whereby it is necessary to stop the machine before throwing in the gears. This applies to the tumbler type of change gearing.

*Paper read recently before the American Society of Mechanical Engineers.

steel is given an oil treatment, and is also annealed before machining. The oil treatment is as follows: Heat to 1,550 deg. Fah., and quench in oil. To anneal, reheat to 1,350 deg. Fah., and cool very slowly. It is then ready to machine. After machining, it is carbonized as follows:

Pack in any good carbonizing material and cover very carefully to exclude air, place in furnace and heat to 1,700 deg. Fah.. and hold long enough to get the desired depth of casing. Care should be taken to have it heated entirely through. Ordinarily three to four hours will suffice for this process. Then take out of furnace and cool off in the boxes; remove from the boxes and place in furnace or bath; reheat to 1,550 deg. Fah. and quench in oil. Again reheat to about 1,380 deg. Fah. and quench in oil or water according to the size and shape of gear. If the gear is of generous dimensions and free from sharp corners, water is preferably used. Small slender gears are quenched in oil, on account of the liability of cracking if water be used. For ordinary gears, the scleroscope test should show 80 to 85 points of hardness. If the gears are used as clash gears they should be drawn to 475 deg. Fah., or about 70 to 75 points of hardness, by scleroscope test, to avoid chipping.

The various kinds of steels used for gears are of such a nature that they do not call for treating before machining, but where extra toughness in shafts is required to withstand torsion and bending strains, 3½ per cent. nickel steel is very satisfactory. This grade of steel is rough machined, then heat treated, as follows: Place in open furnace or bath, heat to 1,500 deg. Fah., and quench in oil. It is advisable to experiment with a small quantity in each batch before subjecting a whole lot to the drawing out heat, which should commence at about 700 deg. Fah. If the scleroscope registers between 50 and 58, the correct hardness has been obtained; if higher than 58, the parts should be reheated to a higher temperature than before; if lower than 50, the parts must be rehardened. After this treatment, the pieces are finish machined. No further hardening is necessary. When machining slow speeds and feeds must be used.

Practically all alloy steels and all low-carbons steels are hardened after machining and finished by grinding after hardening. About 0.010 in. on the diameter is left for this operation. All gears should run true, and to obtain this result not only are the holes ground true with the pitch circle, but the hubs are ground on their faces so they will set square with their shafts when tightened up by nuts. The scleroscope test for 30 to 35 point carbon machinery steel is anywhere from 80 to 90, and for 5 per cent. nickel steel for ordinary gears 80 to 85, and for clash gears 70 to 75. All steels are tested by the file in addition to the scleroscope. The file test by an expert is very reliable, and some feel that possibly more confidence can be placed on his judgment than on any testing instrument.

The above notes apply to spur and bevel gears. For worm and worm-wheel drives, the worm should be made of machinery steel, casehardened, and the wheel of a hard bronze. Both should run in a bath of oil, especially if under high speed and heavy duty. Spiral gears should be used only where the duty is light. The material should be the same as for a worm and wheel, and they should also run in oil to avoid cutting.

For index mechanisms, where accuracy is essential, if the worm is hardened the thread must be ground afterwards. This is done in all the spiral heads of Brown & Sharpe make. Generally, the worm, made of tool steel, is left soft. Worm wheels for indexing purposes only are usually made of cast iron, and, invariably, if of larger diameter. High-multiple threaded worms for indexing mechanisms should not be used; a double thread can be tolerated, but not more, if accurate indexings are required.

STEEL VS. CAST IRON PIPE.

EVIDENCE of local failure of cast iron or steel pipe is of little value in comparing the advantages of the two metals for water or gas pipe lines, unless one has evidence of the behaviour of both under similar conditions, as the conditions vary greatly with the nature of the soil in which the pipes are buried as well as with the analysis of the water or gas passing through the pipes. Cast iron pipes naturally have the advantage of being under ground longer than steel pipes, which have come into common use only during the last 20 to 30 years. The results which have been obtained up to date with steel pipes are so satisfactory that there is no reason why steel mains should not have a life as long as, if not longer than, that of cast iron pipes.

One of the first instances of the adoption of a steel main was for the water supply of Melbourne, Australia, more than 30 years ago, and the example of Melbourne has been followed by all the leading centres of population in Australasia, particularly during recent years, after an experience of 20 years or more in Melbourne which demonstrated the reliability and freedom from corrosion of the steel pipes.

Steel Pipe Coating.

The main feature to which steel pipe makers are now devoting attention is the coating of the pipes and this has now reached such a point of perfection that not only are the pipes amply protected from the effects of the surrounding soil and the flowing water, but they are able also to resist satisfactorily the effects of electrolysis. For example, it is found that when electric cables are laid in close proximity to cast iron gas or water mains, the effect is occasionally to form holes in the cast iron pipe almost as regular in form as if they had been drilled. In order to prevent this it is customary to link the cast iron pipes together with copper bands.

When, on the other hand, steel pipes are well coated with Dr. Angus Smith's solution and wrapped in tarred Hessian, the effects of electrolysis are practically eliminated. This is found to be the case in large centres in the British Isles where steel pipes are used to avoid the trouble which was experienced with cast iron pipes under electric tramway installations. The steel pipes are cleaned before they are dipped hot in a hot bath of coating solution, and as the coating adheres more easily to hot steel than to cast iron, it is natural that the efficiency of a coated steel pipe is better than that of a coated cast iron pipe which is more or less porous.

The Failure Features.

A few failures of steel pipe installations have been reported from time to time, but, when the causes of the failures have been thoroughly investigated, it is a question whether, under the same conditions, a cast iron pipe would have been able to show as good results. For example a steel main of about 39 miles in length was furnished to the town of Port Elizabeth, South Africa, and after about ten years' operation some portions of the pipe were reported to be corroded. Two well-known South African engineers were appointed to investigate and report on the condition of this pipe line. Their interim report was published about July of this year, and shows that while some corrosion has taken place in portions of the line, other portions are in first-class condition and that as far as external corrosion is concerned there is no need for alarm.

When this report was submitted, the engineers had not examined the pipes for internal corrosion, but the town engineer, who was appointed to report jointly with the consulting engineers, stated, that, as far as he was aware, no internal corrosion had taken place.

The pitting was due in some places to sulphuric acid resulting from oxidation of the pyrites in the soil. Six samples of the soil were analyzed at another section and were found to contain a number of pyritic and manganitic nodules and the pitting action was due to magnesium chloride and sulphuric acid resulting from the weathering of the pyrites. The action in the above cases was accelerated by the presence of brak water containing a large quantity of salts and dissolved solids amounting to not less than 1.0031 per cent. of volume.

It is evident that the conditions through which portions of this main pass are very destructive, as sulphuric acid is well known to be a very active solvent of cast iron and steel. It is quite certain that under similar conditions corrosion would be induced no matter whether the pipes were made of cast iron or steel.

The pipes used for the Port Elizabeth works were not wrapped with Hessian, whereas the practice adopted in Canada by all engineers who use steel pipes is to have them covered with this Hessian coating. Had the Port Elizabeth mains been wrapped with the Hessian no trouble would have been experienced notwithstanding the corrosive nature of the soil.

The good features of steel pipes are well known to water works engineers who have in the past been troubled by broken pipes and flooded streets. About 500 to 600 miles of sizes varying from 2 in. to 72 in. in diameter, are already in use in Canada for gas and water mains, and the demand is increasing rapidly from all parts of the country.

WASTEFUL COMBUSTION—THE SMOKE NUISANCE.

THERE is an aspect of this question of wasteful combustion and the smoke nuisance, writes a correspondent of the "Manchester Guardian," which continually causes wonder to those who come into close touch with the management of mills and works; it is the extraordinary absence of reasonably scientific methods in the average boiler house. The most up-to-date and exact principles are adopted and enforced in the engine-house and through all the different operations of production, but they so very often stop short at the steam generation equipment.

This is all the more remarkable when one considers how largely the item of coal at to-day's high price must enter into the cost of production, and one would, therefore, think that the most strenuous efforts would be made by every mill-owner to obtain perfect combustion and the most economical burning of his coal.

It is often the case, however, that a boiler-house is manned by stokers who are stokers only in name—mere laborers, who throw coal on anyhow, and whose only object is to keep up the head of steam.

Stoking is a fine art, and good hand-firing is probably as economical and produces as little smoke as any mechanical apparatus yet on the market. If our factory and plant owners could be influenced to put highly skilled and well-paid stokers in their boiler-houses, and relieve them of all other duties, such as oiling or attention to engines, they would do much to minimize the smoke evil so far as industrial smoke is concerned.

AIR CYLINDER LUBRICATION.

THE following data relative to the lubrication of air compressor cylinders appear in a pamphlet issued by the Fidelity and Casualty Company, and in view of the fact that air compressors form, in a large number of instances, a highly important feature of power plant equipment, the information should be not without interest to a wide circle of our readers.

"Recent disastrous explosions in air compressor systems present striking examples of the danger existing from use of ordinary engine oil in the air cylinders. Only a pure mineral oil, with a flash point as high as good lubricating qualities will permit, should be used. An excessive amount of oil should be kept out of the system.

"Numerous cylinder oils are compounded, and such oils are likely to produce a carbon that will stick the valves, and collect on the valve faces and other parts of the cylinder and valve chambers, resulting in a dangerous condition.

"Air receivers are liable to explosion from accumulated oil deposits. Every receiver should be equipped with a pressure gauge, a safety valve, and proper drains, and all reservoirs and likely places of deposit in the air line should be thoroughly and frequently drained and cleaned. It is bad practice to have the inlet of an air compressor taken from a hot or dusty room—the air should be cool and as clean as possible.

"The practice of throwing kerosene oil into the inlet of an air compressor to clean it is an extremely dangerous one, and the cause of an explosion under such circumstances is not difficult to understand. Lubrication of the air cylinder with soap-suds (preferably made of soft soap, about one part to fifteen parts water) for a few hours each week (or less frequently if the load is light), instead of oil, will help very materially in keeping the cylinder clean. The only danger from the use of soap-suds is rust, and this should be overcome by being careful to discard the soap and feed the cylinder with oil an hour or so before shutting down. The receiver blow-off should then be opened and the accumulation of oil and water drained off.

"An air compressor engine should not be controlled by the air pressure alone, as many are, but should be fitted with an auxiliary governor which will act as soon as the speed rises above a certain predetermined limit. This will prevent the engine from "racing," in case an accident to the tanks or piping causes a sudden lowering of the pressure. It is not necessary for an explosion to take place to produce a lowering of the pressure, as the giving way of a pipe, valve, or tank from any cause will have the same effect.

"The steel used in the construction of air receivers should be of the best quality, and should have a tensile strength of from 55,000 pound to 62,000 pound per square inch. The side seams should be double-riveted, or better still, be butt-strapped. The heads should be dished. The large sizes of receivers should be provided with man-holes."

SAFETY FIRST.

HERE are some "Safety First" maxims given out by Mr. N. S. Dunlop to a meeting of railway men at an address in Montreal:—

Don't throw anything out of a moving train. It's a bad thing to get a mail bag in the stomach from an express running 30 miles an hour.

A brakeman should not sit down on the track and be run over by the train he went to flag.

It takes less time to prevent an accident than it does to fill up Form 74 (the accident report form).

Don't fool with machines. They can be replaced. Hands cannot.

You can start a "Safety First" committee right in your own home.

Get the "Safety First Habit."

Stop supporting the undertaker and the artificial limb maker.

No man should go 24 hours without placing his insurance."

Mr. Dunlop is an enthusiast for "Safety First," a movement which was started on the C.P.R. so long ago as 1885. As Claims Adjuster of that Company, Mr. Dunlop has had to deal with many sad experiences due to neglect of "Safety First" principles.

C. M. A. SELECTS MONTREAL.

THE council of the Canadian Manufacturers' Association met in Toronto early this month, and in deference to the wishes of five-sixths of the membership residing in Ontario and Quebec, decided to hold next year's Convention in Montreal. The offers of Winnipeg and Calgary were, therefore, not accepted. The Canadian Manufacturers' Association has met but twice west of the Great Lakes—once in Winnipeg and once in Vancouver, and it was believed that as the middle Canadian West had never been favored with a Convention, the Calgary invitation might be accepted. It is known, however, that the Winnipeg and Vancouver Conventions were not a success in point of attendance.

DISASTROUS BOILER EXPLOSION AT MIDLAND, ONT.

TWO men were killed and three injured in a boiler explosion at the sawmill of Manly Chew, Midland, Ont., on the morning of Oct. 21. The installation consisted of a battery of four boilers, and, looking from the front, it was No. 2 that exploded, counting from left to right. Why it exploded has not yet been determined. A jury empannelled to inquire into the cause of the death of one of the men, returned the following verdict:—

"That the jury find that H. A. Sagar came to his death on Oct. 21st, 1913, at Mr. Manley Chew's mill by the explosion of a steam boiler, the cause of which is unknown, and, that his death, from the evidence given was purely accidental. We would recommend that the Government be requested to apply the same thorough tests to stationary boilers used for power purposes as that applied to marine boilers, and that a copy of the evidence and this verdict be sent to the attorney-general."

The jury was a very capable one, the foreman being a man who has had considerable experience with the operation of boilers.

The explosion being one of the most disastrous and, therefore, most important to occur for some time, the Government and several insurance companies are taking a keen interest in the matter. It is significant, however, that the boilers in this saw mill were not insured.

The mill had been running less than an hour on the day of the explosion. The engineer was in the engine room, and escaped; the fireman was in the fuel house, the small wooden building seen in the photograph, and he too escaped. Harry Sager, who was killed, was assisting to fire the boilers, and was blown through the brick wall, it is believed. The other victim, Freddie Fraser, aged 18, was a teamster, and was standing at the boiler house door, where he received the full force of the explosion, and was buried in the debris. Part of his wagon is seen in Fig. 5.

FIG. 1. FUEL HOUSE ON RIGHT, WHICH WAS MOVED SIX FEET. ALSO NO. 1 BOILER AND STACK.

The boiler-room measured 130 x 40 feet, was of brick, and was completely demolished. It contained four horizontal return tubular boilers, 66 ins., diameter, by 14 ft. long, operating at 90 lbs. pressure. Each boiler contained 76 iron tubes $3\frac{1}{2}$ ins. diam. All the tubes were blown out of the front head, Fig. 5.

The boiler shell was of 5-16 inch plate, and the heads of 7-16 inch iron plate, with double riveted, lap jointed longitudinal seams, having $\frac{5}{8}$ inch rivets of 2 5-16 inch pitch. The circumferential seams were single riveted lap joints, with $\frac{5}{8}$ inch rivets of 2 inch pitch. The heads were braced by two double angles, back to back, 3 x 3 x $\frac{3}{8}$ inches, secured by 17 rivets of $\frac{5}{8}$ diam. in the bottom pair, and 13 rivets of $\frac{5}{8}$ inch diam. in the top pair. There were four diagonal stays on the bottom angle, and two on the top angle. The palm of stays were held by two $\frac{5}{8}$ inch rivets. The size of manhole was 15 x 10 inches, as near as could be measured, it being badly fractured.

When the explosion occurred, all the safety valves were working freely, and blowing off at 95 lbs. pressure. The safety valves were 4 inches in diam., and of the lever type. The face of the explosion must have been backward and downward, as half of the back course was left almost in its original position on the foundations. The top half was found about 200 feet behind the boiler setting, and on the other side of the picket mill, so that it must have been blown completely over the mill.

The tubes and back head went forward sixty feet. The shell was fractured in all directions, and torn completely off the back head, and partly off the front head. Lamination was visible in many parts of the plating.

Fortunately, the fire in the boilers was blown towards the front, and clear of any rubbish or fuel, otherwise the whole plant would have been demolished by fire.

FIG. 2. FRONT VIEW OF BOILER HOUSE TAKEN FROM THE RIGHT.

Another piece of good luck was the fact that the employees around the plant were few in number that day, or the loss of life would have been heavier. The building in the rear of Fig. 1 is the picket mill, which was partly wrecked, and usually employs a large number of boys.

FIG. 3. STEAM HEADER SHOWING THROUGH ROOF OF MILL.

In Fig. 1 the wooden building on the left is the fuel house. It was pushed six feet to the right. Fig. 2 gives a view of the wreck from the front of the boiler house, from the right hand side. Fig. 3 gives a view from the left of the boiler house at the rear, and shows No. 1 boiler lying near the fuel house. Fig. 4 shows No. 3 boiler blown on top of No. 4, and the smoke stack in several pieces lying near. The building behind is the mill. The photograph, Fig. 5, was taken from the left front of the boiler house, Fig. 2 being from the right. In Fig. 1 a piece of the steam header can be seen in the roof of the building.

The boiler was blown to fragments, and the rupture apparently occurred along the longitudinal seam, on the right hand side, at the front end. The damage done amounted to from $12,000 to $15,000.

The liabilities have not yet been setled, and will probably be determined in the courts. S. M. Medcalf, chief inspetor of steam boilers for Ontario, is conducting an investigation into the affair.

PACKINGS FOR FEED WATER PUMPS.

By T. M.

PERHAPS no other part of a power plant equipment should receive more careful attention than the boiler feed pump. The engineer has learned the vital importance of keeping this particular pump in as near perfect running order as possible and bends every effort towards this end. The conditions under which it operates are admittedly severe, and its failure at the critical moment may often be traced to design, material and workmanship, or to its accessories, such as oils, packings, fittings, etc.

The law of supply and demand pretty well regulates the design and construction of feed water pumps, and the reputable pump manufacturers are practically agreed upon certain standards which keep their records surprisingly free from complaints. The durability and successful performance of these specialties is usually the result of proper selection on the part of the engineer.

The ever varying conditions make the proper selection of packings for pumps a very important matter.

The feed pump piston packing is continually subjected to three conditions—high temperature, high pressure and water. Many meritorious packings will withstand one and often two of these conditions, but the skilled engineer will think carefully before adopting as a standard the packing best suited for all three of the conditions mentioned, and since the actual cost of a high grade packing required each time the pump is repacked will usually not exceed an average of more than $1.25, it is needless to observe that his judgment should not, and in most cases is not, influenced by the question of first cost. He knows that his superiors demand security, and his efforts are directed to that end.

As the opinions of professional men often differ sometimes widely on given subjects, just so will they differ among engineers as regards the type and construction of packing for this purpose, but well informed engineers all agree that in order to give them permanent security, the packing for this purpose should unquestionably be made of the highest grade materials obtainable, manufactured with care and precision and able to withstand the above mentioned conditions, viz., high temperature, high pressure and water.

It is not the intention of the writer to specifically mention in this article the names of packings which are most highly regarded for this purpose; but he will be pleased, from time to time, to make any suggestions or answer inquiries from our readers pertaining to this line.

FIG. 4. SHOWING NO. 3 BOILER ON TOP OF NO. 4.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

MACHINING OF WHITE METALS AND ALUMINUM CASTINGS.

By P. W. Blair.

THERE has been, within the past few years a great demand for manufactured goods from the various white metals owing to the cost and wearing qualities of same. The following article, therefore, has been prepared in order to give the most important points on the above subject, based on practical experience during recent years.

Besides the well-known bearing metals, there is a long series of white metals which, according to the main constituents, may be reckoned as aluminum, tin, lead or zinc alloys. Without considering punched or pressed articles which are not worked upon with cutting tools, there are numerous objects which were previously made from brass or bronze, but which are now, on account of their improved appearance and wearing qualities, the reduction in weight or other properties, made from aluminum or other white metal alloys.

Aluminum Alloys.

Aluminum not alloyed with other metals is also used for a great many machine parts and devices. The automobile industries are large users of aluminum castings, also the manufacturers of pneumatic vacuum cleaners. Commercially, pure cast aluminum has a tensile strength of about 14,000 pounds per square inch, which is too low for many purposes. In order to increase the strength of aluminum, it is therefore, alloyed with other metals. So called aluminum-bronze is an alloy of copper with from five to eleven per cent. aluminum, which increases the tensile strength of the copper from 28,000 pounds per square inch to from 85,000 to 110.000 pounds per square inch. Aluminum-bronze is of a light yellow color, and is not as heavy as any of the ordinary bronzes.

It shrinks in casting about twice as much as the ordinary castings made from bronze containing tin, and must have heavy gates on same to insure success. The castings, therefore, are often porous and the increased strength rather imaginary. The casting of aluminum-bronze is, therefore, a difficult matter, and requires special skill in the molding, smelting and pouring of the metal to insure success. Alloys containing aluminum as a base and a small addition of other metals are, therefore, of greater value.

The alloy with magnesium is especially well known. Magnalium containing from three to ten per cent. magnesium, has two and a half times the tensile strength of aluminum, and is at the same time lighter, it has, therefore, been generally adopted in the building of aerial craft and has proven more successful than aluminum. The addition of the magnesium makes the metal firm and less tough, so that it can be worked more easily with cutting tools or machined. If the magnesium content is too great, the metal becomes too brittle and is useless.

FIG. 5. FRONT VIEW OF BOILER HOUSE TAKEN FROM LEFT.

Machining Difficulties.

The main difficulty met with in the working aluminum and aluminum alloys is the carrying away of the chips. Those become so firmly imbedded between the teeth of milling cutters, counterbores, and similar tools that they cannot be removed with a stiff brush, and the machine has to be stopped for their removal which makes operations slow, owing to time consumed removing the chips when they become clogged in the teeth of the cutters. The only way to overcome this to a great extent is to use the right kind of a lubricant. Oil cannot be used, as it is of no benefit, but soapy water gives good results, although leaving a dull surface.

The best cutting lubricant is kerosene, which gives a bright mirror finish when cutting tools are properly ground. The cutting edges of all tools should have sharp corners or edges. Rounded corners on tools and cutters are objectionable, and there should be plenty of cutting relief or clearance on the tools. For milling flat surfaces, it is best to use end mills rather than cylindrical cutters. The mills will cut best if a high cutting speed is used with a moderate feed. The depth and width of the cut is of less importance. A cutting speed of 325 ft. per minute can be considered as practical, and from 2 to 4 cubic inches of metal may be removed per minute in aluminum.

Britannia Metal.

Rolled Britannia metal is composed of from 90 to 92 per cent. of tin, from 4 to 8 per cent. of antimony, and from 2 to $2\frac{1}{2}$ per cent. of copper.

Cast Britannia metal is composed of 80 to 85 per cent. of tin, 9 to 17 per cent. of antimony, 1 to 3 per cent. of copper, and from 0 to 3 per cent. of zinc.

Cast Britannia metal is less tough than the rolled metal, and is more easily worked by cutting tools. Cast metal can be worked without a lubricant when cutting same, which is not possible with the rolled metal. With the same cutting speed as is used for aluminum, from 1.25 to 1.5 cubic inch of metal may be removed per minute. The adding of antimony makes this metal more brittle, but also more easy to machine. A number of engine builders use a composition for white metal bearings, composed of tin 83 per cent., antimony 11 per cent., copper 6 per cent. This composition machines without lubricant and works freely.

White Metal for Pattern Work.

A white metal for pattern work, and in general use, giving good service, is composed of 3 per cent. tin, 1 per cent. zinc, 1 per cent. copper. This alloy is well adapted for pattern plate purposes, and works freely without lubricant on machine tools or files. Zinc is most commonly used for cast articles which are to be plated with copper or nickel.

Zinc Alloys.

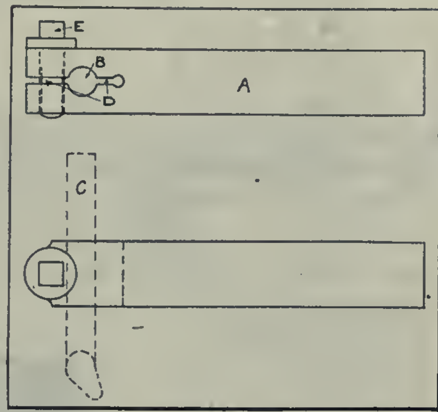
Zinc is also used in bearing metals, because its cost is less than tin, and it stands wear better than lead. This bearing metal is composed of from 60 to 80 per cent. of zinc, from 10 to 35 per cent. of tin, 5 per cent. of copper, and a small per cent. of antimony. Zinc alloys can be easily machined dry. They have the disadvantage that the castings are somewhat porous, which causes trouble in the plating. Pure lead is very difficult to work and a very small feed should be used. The width of the cut can be of fair proportion on a slow speed with thin edged tool and plenty of clearance.

It may be generally remarked that it is impossible when working white metals to take full advantage of the efficiency of modern machines of cutting tools, and that the addition of antimony or magnesium to the alloys makes the metals mentioned more easily machined.

AN IMPROVED BORING TOOL HOLDER.

By W. G.

THE boring of small holes is very often a difficult matter, particularly when the operation is performed by means of the ordinary solid boring tool, the stem of which is not adjustable for length. This fact alone very often accounts for holes being out of true. The nearer the cutting edge to the tool shank the more rigid the tool will be in operation. This is of vital importance with boring tools, such as are generally considerably weaker than ordinary outside turning tools. The accompanying illustration shows an improved boring tool holder, particularly adapted for service with small boring tools of the type usually made from silver or similar bright drawn steels, the object being to provide means for adjusting length of tool in accordance with depth of hole to be bored, also means for positive clamping of tool, the combination thus securing the maximum of rigidity during the operation of boring. The tool holder (A)



IMPROVED BORING TOOL HOLDER.

is preferably made from a piece of square mild steel, having a hole drilled through, as shown at (B) for the purpose of receiving the tool (C), shown dotted. The saw split (D) is used in conjunction with the pin (E) for the purpose of securing the said tool in any desired position.

LENGTHENING FEED SCREW FOR STONE LATHE.

By "Retals."

WE were recently asked to lengthen a 3 in. dia. 26 ft. long feed screw for a stone lathe to 36 ft. The job called for welding the extra length on the threaded part. Realizing that a blacksmith's weld would ruin about a foot of the thread or leave it in such condition that re-threading would be difficult and at best leave some flat spots, we consulted the local acetylene welders, who guaranteed, and later carried through an exceptionally good job. We took a bar of machine steel of the required extra length of the screw, plus enough extra for holding, turned the end down below the bottom diameter of the thread, and sent it to the welder along with the screw which we previously sawed off square. As already stated, an excellent welding job was made, although careful transportation was necessary on account of the length and danger of bending.

To machine the screw in the lathe—the longest available being 20 in. by 16 ft. centres—we took off the tailstock and put the welded part with the end turned down into a coupling fitted up as a positive chuck with 3 set screws held on the face plate, and let the other end extend out back of the end of the lathe, supporting it where necessary. We had to straighten it some where the ends were joined, but the weld stood the operation successfuly. A steady rest was placed at the extreme end of the lathe bed, and another close to the cutting operation to insure accuracy. The nut was solid, and we left it on the screw during welding so that we could cut the thread from the old part on to the new and have the nut handy for a sizer, and be sure that it would pass over the joint, also avoiding the otherwise necessity of taking the screw out of the chuck to try the nut on. Handling a long flimsy screw is no joke.

After we had the new part turned and the thread cut, the end bearing was turned and the extra length for holding cut off.

Extreme accuracy was not altogether necessary; our results, however, were good enough for the ordinary run of turning lathes.

FILLING OIL TANKS.

By J. E. McCormack.

WHEN filling 5-gallon oil tanks or cans from barrels stored in a cold place without the aid of an oil pump, the work may be hastened by fixing a nipple and piece of rubber tubing with mouth piece attached to the air vent; thereafter, by blowing through the tube, sufficient air pressure can be obtained in the barrel to greatly accelerate the oil flow. The tubing should be sufficiently light so that by squeezing it between the thumb and fore-finger, the pressure can be held inside the barrel while the operator takes a breathing spell.

SCREW THREAD DATA.

Threads per Inch.	U.S.S. Thread.	V. Thread.
3	0.43333	0.57733
3½	0.37114	0.49485
4	0.32475	0.43300
4½	0.28866	0.38488
5	0.25980	0.34650
5½	0.23618	0.31490
6	0.21650	0.28866
7	0.18555	0.29742
8	0.16237	0.27650
9	0.14433	0.19244
10	0.12990	0.17320
11	0.11809	0.15745
11½	0.11295	0.15060
12	0.10825	0.14433
13	0.09992	0.13323
14	0.09278	0.12357
16	0.08118	0.10825
18	0.07216	0.09622
20	0.06495	0.08660
22	0.05904	0.07872
24	0.05412	0.07216
26	0.04996	0.06661
28	0.04639	0.06185
30	0.04330	0.05773
32	0.04059	0.05412
36	0.03608	0.04811
40	0.03247	0.04330
44	0.02952	0.03936
48	0.02706	0.03608
50	0.02598	0.03464
56	0.02319	0.03093

Notation.

A=Constant; B=outside diameter; C=root diameter; P=pitch or number of threads per inch.

Formulae.

U.S.S. Thread.—$A = \frac{1.732}{P}$

V. Thread.—$A = \frac{1.2990}{P}$

$C = B - A.$

DEVELOPMENTS IN MACHINERY

A Record of New and Improved Machinery Tending Towards Higher Quality and Economical Production in the Machine Shop, Blacksmith Shop or Planing Mill.

10½-INCH VERTICAL SHAPER.

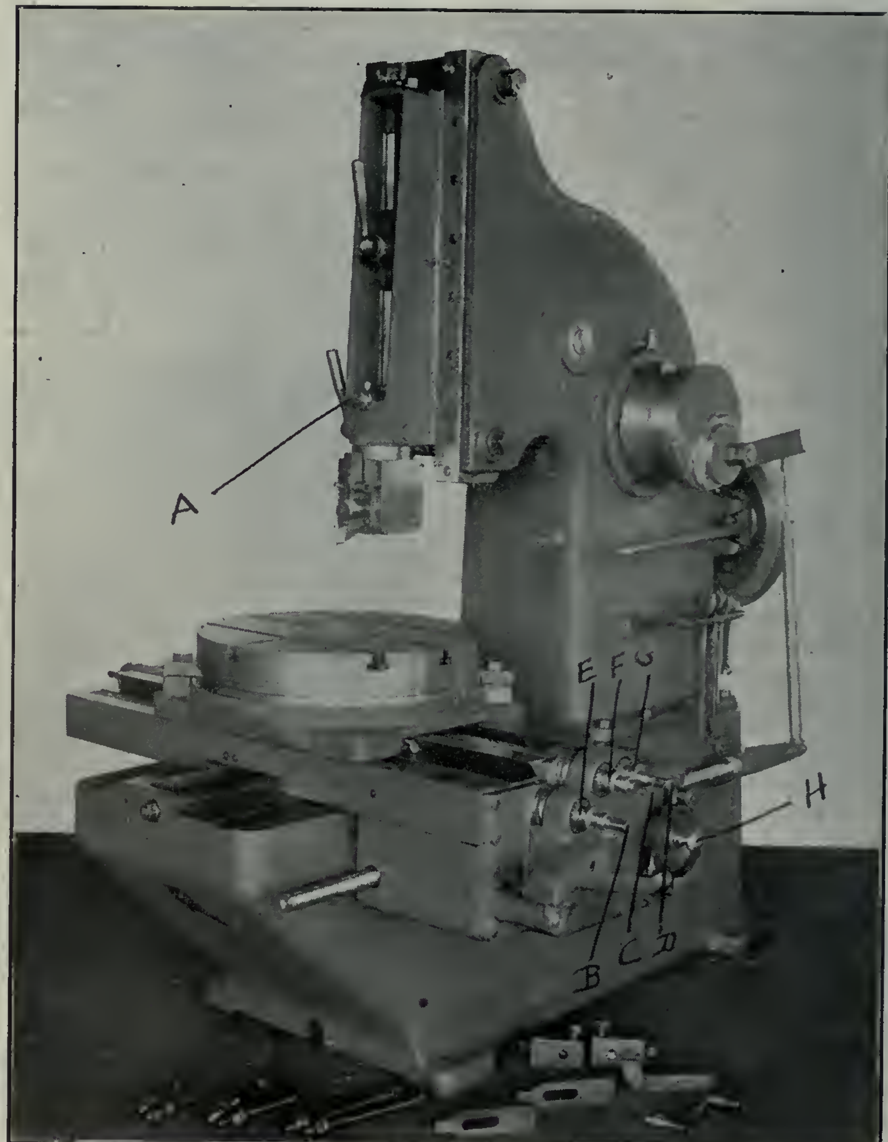
THE general design of this larger vertical shaper differs only slightly from the maker's smaller one, the most marked variation being that the rotary table is provided with power feed in addition to the hand feed, there being no provision made for the quick indexing of the table as in the smaller machine. It will also be noted that the means for relocating the ram is slightly different from the smaller unit. This machine is too high to permit the use of a hand wheel at the top of the ram, consequently the screw for adjusting this is actuated through beveled gears from shaft (A), the ram head binder being placed at the side so as to permit this. A powerful worm and worm wheel is used for conveying the power to the ram instead of spur gearing as used in the smaller machine.

The solution of the power feed problem is worthy of special attention. It will be noted that the entire mechanism is self-contained in one compact unit attached to the saddle at the right. The longitudinal, transverse, and rotary power feeds, also the hand feeds, are conveniently controlled from this unit. The transverse feed is conveyed through shaft (B); longitudinal through screw (C); and the rotary through shaft (D). In operating the hand feed, a crank wrench is used, the ends of the shafts being squared for this purpose. The various power feeds are engaged through the sliding pinions (E), (F), and (G). As shown in the illustration, these pinions are in the outward position, the power feed being inoperative. The pinions are advanced to the inward position for engaging the power feed by hand, and are made of suitable form so that this may be easily accomplished. The rate of feed is controlled through a feed pawl and ratchet, provision being made for conveniently obtaining any desired variation. The direction of the feed is controlled through knob (H), it being pulled in or out according to the direction desired.

In the design of this machine, features are incorporated which make it possible to conveniently handle slotting machine work, also the regular line of work handled on the horizontal shaper. The range of work which this machine is capable of handling is so large that there ought not to be the slightest difficulty for users to keep it supplied with work. This is a very important point.

The machine is proportioned to give high stability, and an abundance of power sufficient to meet every requirement, while the operation strains tend to hold all of the parts such as knees and slides together. All of the operating requirements are within easy reach of the operator, and may be conveniently controlled. Angular adjustment to the ram is provided.

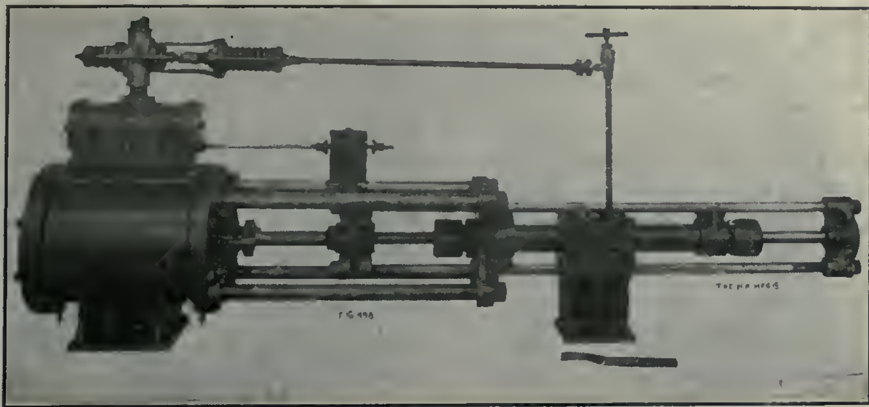
The feature of swivelling the ram head which permits the location of the cutting tool in the most convenient position is also a valuable feature. With this construction, the various sides of certain work can be planed at one setting. The feed always takes place with the ram at the extreme upper position, when the tool is clear of the work. The tool post is mounted in a clapper which prevents the tool from being injured due to dragging on the return stroke. Provision has also been made whereby the clapper may be bound solid with the head in case exceptionally long tools are used for internal work. The ram may be stopped and started entirely independent of the countershaft by means of a friction clutch easily controlled through a conveniently placed lever. The driving mechanism is so constructed that it forms a perfect counterweight for the ram, thus a free, easy running action is obtained. Micrometer dials are provided for accurately governing the various feeds. A graduated dial is also provided by means of which the correct length of stroke may be readily obtained. The floor space occupied is 6 ft. by 7 ft. 6 in., while the height is 8 ft. 6 in. Pratt & Whitney, Hartford, Connecticut, are the manufacturers of this product.



PRATT & WHITNEY 10½ IN. VERTICAL SHAPER.

HYDRAULIC STEAM PUMPS.

A NEW line of hydraulic steam pumps has been designed by The Hydraulic Press Mfg. Co., Mount Gilead, Ohio. This new design is the result of an extended experience in designing, building and operating hydraulic presses, pumps and valves for a wide variety of high pressure purposes.



HYDRAULIC STEAM PUMP.

Based on the steam end dimensions, the line covers twelve sizes, and on the water end dimensions seventy-one sizes. This pump is of the single cylinder, double acting pattern, and is shown by Fig. 1. The notable features are as follows:—

1.—Long stroke of steam and water pistons, the stroke being longer than provided in previous designs. Elaborate experiments and experience have proven that a long stroke is more economical in steam consumption for pumps of different capacities. The number of strokes or reverses are less. This reduces slippage at the water valves as well as the wear on all moving parts. Another advantage is that a given steam piston can be used with a small water plunger to give the same capacity. On this account the steam pressure may be reduced for a given water pressure, therefore the advantage of a lower steam pressure is gained. A pump having a long stroke with given steam and water ends has a larger capacity, hence a greater value than the average pump with shorter strokes having the same size water end.

2.—Design of valves and gears prohibits short stroking.

3.—Steam valve gear permits adjustment to be made while pump is in motion.

4.—Cushioning of moving parts is fixed and positive, and does not require adjustment.

5.—Steel forgings are used for all water ends for pressure above 2,000 lbs.

6.—Large water valve areas.

7.—Removable valve seats.

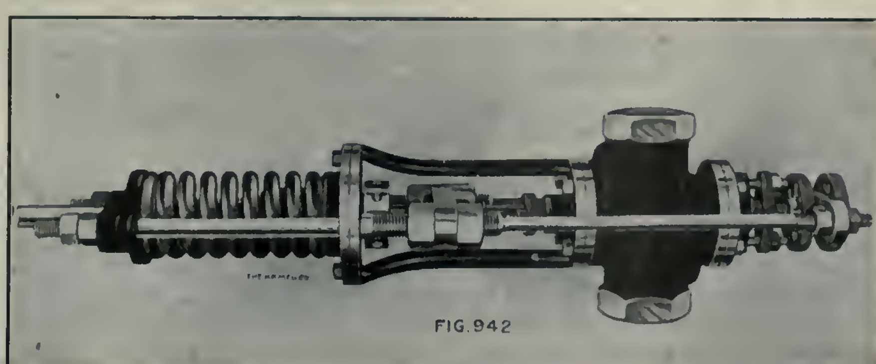
8.—Even compression in tightening hydraulic packings.

9.—Accessibility of all parts.

Pressure and Speed Governor.

Fig. 2 shows the Mount Gilead pressure and speed governor which regulates the speed and pressure of the above described pump. It provides a simple and automatic control for all makes of hydraulic steam pumps.

This governor is provided with an adjustment which can be set to govern any speed and pressure desired. Two important things are accomplished by the governor without the attention of the operator. First, it cuts off the steam supply to the pump when the predetermined maximum pressure is reached, thus preventing possible breakage of pump, presses and fittings through excessive pressure. Second, it regulates the speed of the pump to any number of strokes for which it may be adjusted, thus preventing the pump from racing, should the pressure be released suddenly.



HYDRAULIC STEAM PUMP PRESSURE AND SPEED GOVERNOR.

NEW TYPE OF CONDENSING TURBINE.

TWO main objects have been kept in mind in the design of the latest type of Terry condensing turbine. These were an economy approaching that of the larger units used in power installations, and the overcoming of the old trouble of air leakage into the condenser.

This air leakage, it is claimed, has been completely overcome. The only gland exposed to vacuum has been shift-

NEW TYPE TERRY CONDENSING TURBINE.

ed from the end of the casing to the middle, where it is exposed on one side to vacuum and on the other to steam at just above atmospheric pressure. This makes the leakage of air through this gland almost an impossibility.

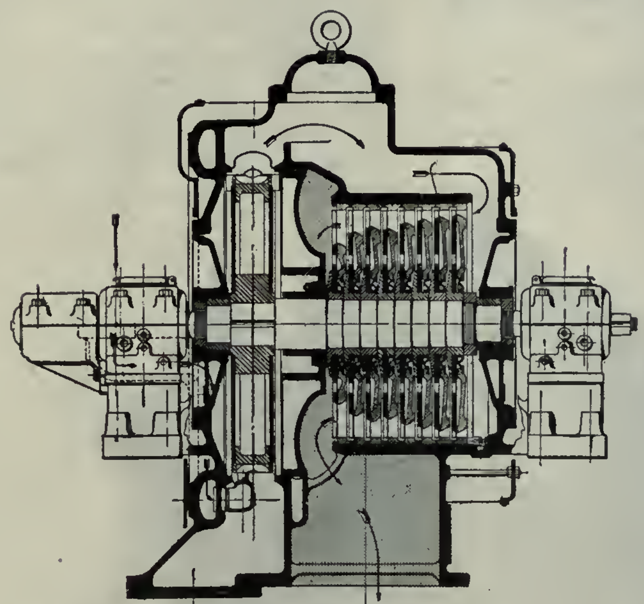
The machine consists essentially of a regular Terry multi-velocity wheel as the high pressure element, and a low-pressure end consisting of several multipressure impulse elements. The main feature distinguishing the arrangement of this low-pressure element lies in the fact that it has been turned end for end, receiving steam at the end farthest from the high-pressure element and exhausting into the condenser connection at the centre of the turbine. By this simple device of reversing the flow of steam, and thus protecting the vacuum glands, the old trouble of air leakage has been eliminated.

This turbine has the regular Terry characteristics, including casing split on the axial plane, permitting examination of the runner without disturbing steam or exhaust connections. It has the Terry indestructible high-pressure element which permits starting up the turbine from cold, even though a large quantity of water is thus thrown through the blades.

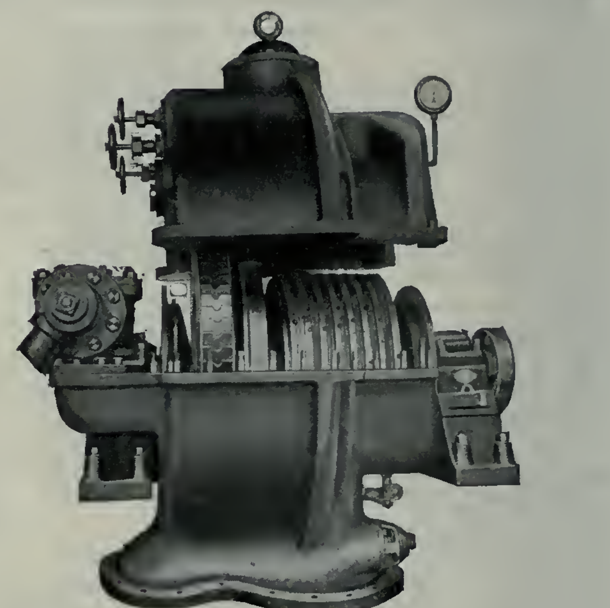
The stationary buckets in the low-pressure end are placed on annular rings, from which they may be removed in blocks as necessary. These rings are not fastened to the casing, but are bolted together and remain with the runner when the casing is removed, as will be noted in the illustration. They are held by friction to the casing when the upper half is drawn down tight to the lower half, and, hence, always retain their position when the turbine is running. The arrangement makes it very simple to examine all parts with a minimum of trouble.

The method of swinging the casing from the bearing blocks instead of from the base, makes it always concentric with the runner. Expansion is radial, and all clearances are maintained practically the same when the turbine is running as when it is cold. The side of the bearing in the pillow block is cylindrical. This is bored at the same time as the casing and from the same centre. It follows, therefore, that under no circumsances can the axis of the runner get out of line with the axis of the casing.

This new design of turbine is being applied to three principle uses:—Driving electric generators, blowers and centrifugal pumps. In all these uses we are informed the Terry turbine has made such a record that fully 80 per cent. of the more than 1,600 units which have been been put to work have been sold on repeat orders. It is of interest that the largest number of repeat orders have come from the United States navy and the British admiralty—two customers of extremely critical tendencies and requiring exceptionally severe tests of every unit purchased. There are more than 300 Terrys in use in these two services. all three of the above purposes being represented.



NEW TYPE TERRY CONDENSING TURBINE.



NEW TYPE TERRY CONDENSING TURBINE.

MONTREAL MUST IMPROVE HER GRAIN FACILITIES.

"IF Montreal wants to hold its grain trade, the facilities for handling should be improved at once, as well as the canal system leading to the port," was the statement made a few days ago by President Ross of the Harbor Commissioners, who went in company with Commissioner Labelle and Assistant Secretary Fennell to Buffalo to investigate the reason for that city getting much of Montreal's grain business this year.

Mr. Ross stated that owing to the low rate of freight to Lake Erie ports of $1\frac{3}{4}$ cents compared with $2\frac{1}{2}$ cents per bushel last year, several millions more bushels of grain would pass through Buffalo this year than last.

"The type of grain business in Buffalo is different from that in Montreal," said Mr. Ross, "inasmuch as the bulk of the shipments is made by railway car to the seaboard, which does not require any conveyor system like this port, where over ten miles of conveyors are in use at the present time."

The British Manufactuers' Association, Ltd., of London, Eng., have opened offices at 803 McGill Building, Montreal, as agents for the following firms: National Gas Engine Co., makers of all types of gas engines, both horizontal and vertical; Daniel Adamson & Co., makers of Rateau turbines, blowers, pumps, etc.; Geo. Shipman & Co., Sheffield. makers of tool steel, etc.; Adams & Co., makers of cotton waste; and Rockdale Asbestos Co., Ltd., makers of asbestos and hydraulic packings. Roderick J. McLean is the manager.

The Bureau of Mines, Department of the Interior, Washington, has published a statement for the month of August, 1913, covering coal mine fatalities in the United States during that period.

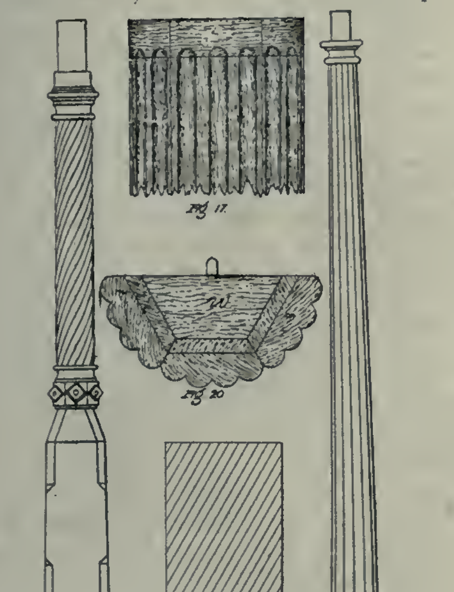
FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

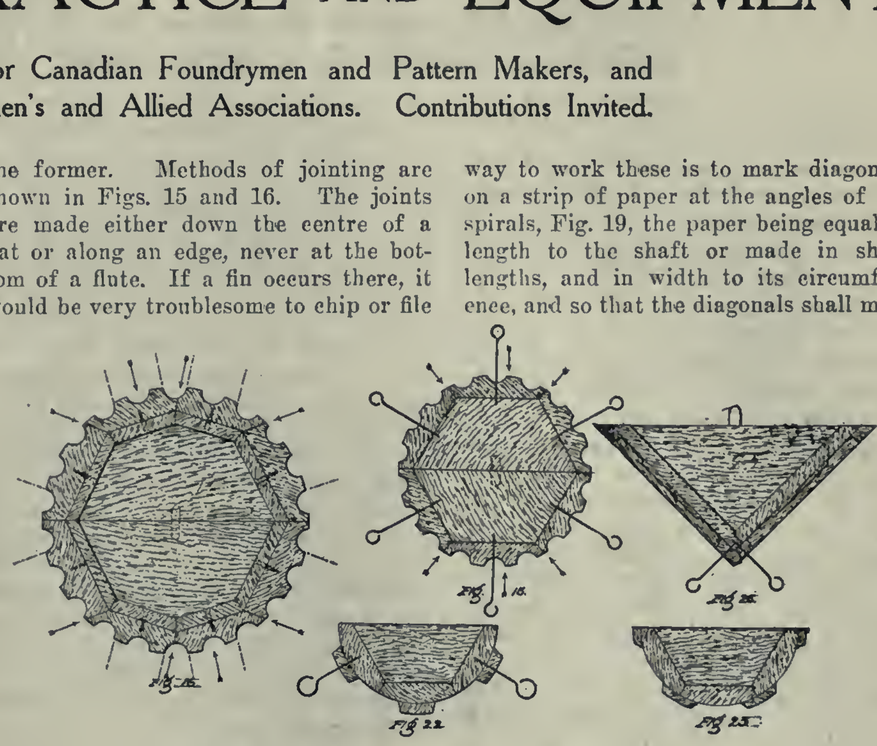
CARVED LAMP STANDARDS.

By Joseph Horner.

THE shafts of lamp standards vary much in design. The plain shaft shown in a previous article requires only the longitudinal middle joint, but other forms must be treated similarly to ornamental work, that is divided into strips to be withdrawn separately. The commonest form is the fluted. The flutes may be deep, approximately semi-circles, or shallows; the latter requiring a smaller number of joints for withdrawal than the former. Methods of jointing are shown in Figs. 15 and 16. The joints are made either down the centre of a flat or along an edge, never at the bottom of a flute. If a fin occurs there, it would be very troublesome to chip or file or grind it off within the flute, while it can easily be removed from the plain flat. The jointing may be radial, but it is better not so, delivery of deep flutes being favored by a more or less diagonal form of joint, as illustrated.



FIGS. 17, 18, 19, 20, 24, 26. CARVED LAMP STANDARDS.

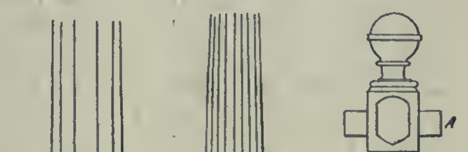


FIGS. 15, 16, 22, 23, 25. CARVED LAMP STANDARDS.

The fluting pieces may be fitted on the solid body of a pattern, as in Fig. 15, or on the laggings of a built-up pattern, Fig. 16, but they should never be bedded directly on cross bars with no other backing, because, unless then made exclusively thick, they would be rammed inwards in the areas between the bars. It is better to fit the flutes to flat faces as shown than to a turned body, because that is more easily and quickly done.

The pieces in which the flutes have to be worked are fitted in place, held with screws and turned, and the flutes marked on them. They are then removed and worked with planes, along the greater portion of their length if the ends terminate abruptly, leaving the ends to be finished with a gouge. A method by which the flutes can be planed throughout is to fit ends across Fig. 17, and screw them on at first, removing them when planing the flutes through, and replacing and working the small radius with a gouge. Sometimes instead of hollow flutings, convex ones are employed. Jointing must still be done, and the number of lags will also depend on the depth of the flutings.

Another form of standard has spiral flutings, Fig. 18. The section at right angles to the spiral is convex. The best way to work these is to mark diagonals on a strip of paper at the angles of the spirals, Fig. 19, the paper being equal in length to the shaft or made in short lengths, and in width to its circumference, and so that the diagonals shall meet and match when the paper is glued round the column. The working is done by the help of a templet. A cut is run round each spiral with a tenon saw to the depth of flute, after which the convexity



FIGS. 21, 27, 28. CARVED LAMP STANDARDS.

is worked with chisels|. How much jointing may be necessary depends on the depth of the flutings. Three strips in each half should be ample in most cases, Fig. 20. An unnecessary number of joints should be avoided because the marks of the joints always show to a greater or less extent on the casting.

Another pattern adopted in the bases of many standards is a panelled one, Fig. 21, which may have plain panels only, or the panels may enclose various devices. How these shall be moulded depends on the shape of the column and on that of the devices. Such a column may be cylindrical, or square, or polygonal. Generally, some portions must be left loose.

In a circular lamp standard, the pattern joint may be made as in Fig. 22 or Fig. 23. The first entails making two pieces on each half loose, but in the second case, if a large quantity of taper is planed, or if a radius instead of a taper is put, these pieces may be left fast. In a polygonal section, some pieces must be left loose, while in a square section, Fig. 24, it is almost always better to joint the pattern diagonally "across corners," Fig. 25, because delivery is much facilitated thus. Unless the strips are tapered a good deal at the edges, the lower strips must be left loose as shown. Usually too, any devices which occupy the panels, Fig. 24, must be loose, the alternative being to give them a great deal of taper and make them rather shallow.

Cases occur in which patterns having square sections cannot be jointed diagonally. They are then done parallel with faces, Fig. 26. In small patterns for handrailings, like Fig. 27, holes have to be cored to pass gas tube through, and the necessary provision of prints (A) settles the method of moulding on the square. The rosettes on the faces are then made fast. With care to avoid undercut, the small flutings on the lower part of the pillar at (B), can be cut in the solid.

Our last illustration, Fig. 28, shows an ornamental portion in which the pattern work may be cut solidly. The joint between the main shaft and the base is at (a), and the portion in the vicinity of (a) is polygonal in shape, which can be worked solidly. The panelled portion of the base below (a) may be treated like the round shafts in Figs. 22 and 23, strips being left loose or fast, depending partly on their thickness and partly on the amount of taper given to the edges. None of the carved work above (a) need be left loose, provided there is no undercutting in the main portion of the device or in the veining. A casting of this kind where there is considerable difference in the diameters must be cored out, the core following the outlines approximately.

With regard to the general methods of moulding these columns they are in the majority of cases simply divided down the centre, and moulded by turning over in the regular column boxes used in foundries. The smaller patterns such as that in Fig. 27 will, though made of mahogany be liable to warp in course of time in the stores and in service. A good method then is to plate them, putting each half on a centre joint-board, and then ramming each half box against the opposite faces of the board. When this is not done, the half-pattern which goes in the bottom should always be rammed on a board which goes in the drag before turning over, and ramming the other half of the joint on it. By adopting these precautions, the moulds are made straight, and, if the cores are centred properly and chapleted and the thickness kept equal, the castings will come out straight instead of crooked. Columns are generally poured at one or both ends, depending on their length, with a riser or flow-off gate at about the centre. If poured at one end only, the riser will be at the opposite end.

BURNISHING METAL.

METALS for various purposes, says "The Ironmonger," are commonly ground bright on stones or wheels of different grades; cut down and polished with various buffs and mops; filed up and burnished, or turned smooth and burnished. Cheap work is usually polished only, but good class articles have time spent on them and the process of burnishing is employed.

There is a big difference between polished and burnished metal, and taking brass as an example, that difference is decidedly marked. Polishing abrades the surface, while burnishing flattens the grains of metal. A polished metal, if properly burnished, has a far finer appearance than one which is merely polished. Compare, say, a brass gasfitting having burnished bands on it, with some polished door-lock furniture, and the advantage of the process will be seen at once. Seen by itself, the lock furniture looks presentable, but, when contrasted with the burnished work, it appears commonplace, lacking the golden appearance which burnishing gives.

Where the articles are round and can be dealt with in a lathe, this method of working is preferable. The succession of cuts produces a smooth surface if the tools are of the right shape, nor will scores or scratches show if the work is carefully done. With handwork, files must be used of succeeding fineness, each one removing the marks of its predecessor, until in the end a dead smooth file leaves the surface in a polished state, free from any marks visible to the naked eye. The use of emery cloth or other similar material is to be deprecated. These leave pieces of grit or specks of hard material in the skin of the metal which catch the burnishers, and a minute grain of, say, emery will spoil both burnisher and work.

Hook and dagger shaped burnishers, which are generally used, are made of hardened steel, very highly polished. During use they must be kept polished on a strip of buff leather attached to a board, and dressed with fine crocus or Tripoli powder. When working on steel, soapy water may be used as a lubricant, but with copper, brass, bronze and the like, stale weak ale or table beer may be used with the burnisher. In using a burnisher in the lathe, it is held against the work with considerable force, the lubricant dripping on the burnisher the whole of the time. Burnishing should be continued until the work has a surface as smooth as glass. With handwork the burnishers are used with heavy pressure, moving them to and fro until the desired effect is produced, plenty of lubricant being used. From time to time during use the burnishers have to be wiped dry and polished.

To remove old burnished work, it must be boiled to remove the dirt and old lacquer, then pickled and dipped, after which it is rinsed and dried, and burnished again. Burnished work is finally lacquered to prevent oxidization, and then it is sometimes necessary to rinse the work to remove the dirt consequent on the use of the burnisher. Careful drying is essential in such cases, plenty of hardwood sawdust being utilized for the purpose. In all cases, lacquering should be done as soon as possible after burnishing.

Government Issues Warning.

The attention of the Minister of the Interior has been called to the fact that certain promoters are inaugurating an extensive stock selling campaign, especially at Calgary, Alta., based largely on a proposed power development project on the Bow River within the city precincts, or a very short distance from Calgary. As no authority has been or is likely to be given for a power development within the district in question, he has instructed J. S. Challies, superintendent of the Water Power Branch, to inform the general public through the newspapers that stock in any Company has no value whatever, as far as a power project on the Bow River within the limits of the city of Calgary is concerned.

TRADE AND COMMERCE RECORD

Dealing With the Steps Being Taken and Progress Made by Industrial Canada To Achieve and Maintain a Dominant Place in the Markets of the World

An Industry That Never Came.

Most towns in Canada welcome with open arms any industry that comes their way, therefore, it was not surprising that the Press of Montreal was jubilant when James Warren opened offices in that city, claiming that he had just arrived from Great Britain, and that his mission was to establish a branch factory of the Peerless Motor Co. in Canada. Mr. Warren rented a suite of rooms in a large building on St. James Street, and a sales warehouse on Bleury Street. Big signs and streamers across the street announced the arrival of the new motor car industry, while one Montreal newspaper informed the public that they ought to feel proud that Mr. Warren had chosen their city for his plant, adding that he would manufacture motor cars and motor cycles. Several men prominent in shipping and industrial circles were given responsible positions in the new concern, which was to have a capital of $500,000. Mr. Warren paid all his debts by cheque, and as these were not honored by the bank, the employees and other debtors demanded an explanation, whereupon Mr. Warren departed for Toronto, and has not been heard of since. Several people who took stock in the concern are, as a consequence, getting rather anxious. When British manufacturers come to this country, they do not open offices in this flamboyant style, being as a rule, rather too quiet, if anysthing, about the matter.

American vs. British Tools.

It is generally understood, especially on this side the Atlantic, that the American is pre-eminent in the manufacture of machine tools. He has been the pioneer in many branches of the work, and American manufacturers are to-day doing a tremendous business in European countries in machine tools. Americans, are often staggered when they learn of the marked advances which British manufacturers are making along these lines, and it is interesting to note the opinion of an English tool maker, who has recently visited the States, and is now travelling in Canada. Walter Deakin, M.I.M.E., managing director of H. W. Ward & Co., machine tool makers, Birmingham, Eng., during an interview in Montreal last week, stated that he was a little disappointed in the United States, as he had found that machine tool makers there were not as far advanced in the business as their advertisements had led him to believe they were. The supremacy of the British manufacturer was not in any danger from the American shops yet, he said. At the same time he admitted they were very aggressive, and were doing a big business in the overseas markets.

More Rolling Stock Wanted.

Those who became alarmed some weeks ago when a Montreal newspaper stated that the car companies would soon be closing down for want of business, will be relieved to learn that the Dominion Government is in the market for new equipment for its railways. Both passenger and box cars are required, but the latter especially are in great demand, owing to increased business on Government lines. It will surprise these people to learn that the Moncton shops of the I.C.R. are overtaxed, and additions to the plant will shortly be required. The C.P.R. are also greatly increasing their output from the Angus shops, indicating that they are looking forward to bigger traffic records. For the five weeks ending November 5, these shops supplied 233 cars of all kinds, and seven locomotives.

Smoking in Factories.

Probably no city in Canada has been the victim of so many fires this year as Montreal. Many of these have been of a suspicious nature, and many undoubtedly of an incendiary origin. There were others of almost equally criminal origin which the authorities would class as "genuine" fires, but which might have been prevented had greater care been exercised. In an effort to reduce the fire loss in Montreal, representatives of the Board of Trade, Chambre de Commerce, the Canadian Manufacturers' Association, Builders' Exchange, the Canadian Fire Underwriters' Association, and the Architects' Association have submitted recommendations to the Board of Control, one of which favored the prohibition of smoking in workshops, factories, places of amusement, and other buildings. Fires are often unjustly blamed on defective wiring, whereas in many cases, if the truth were only known, the cause was due to a cigarette or match. Smoking in some factories, such as woodworking establishments, should be rigorously forbidden, and is forbidden where the manager has any regard for safety. On the other hand, there are plants where employees might smoke with safety if they did not abuse their privilege. When such privileges are permitted, the workman is often careless in throwing away matches and cigarette ends, which often find their way into the wastepaper basket or on to a heap of rubbish. We know of one large drawing office in Toronto where smoking is permitted, and if there is not a fire there some day, it will only be due to the kindness of Providence.

A Large Eye Magnet.

Machinists and other steel and iron workers in Fort William, Ont., are fortunate to live in a city with so efficient an institution as the McKellar Hospital. Ten city doctors have conjointly purchased a powerful eye magnet, and presented it to the above institution. It is an electro-magnet, with a pulling power of 640 lbs. to the square inch, and was purchased from Moyrowitz Brothers, New York, for $500. In and around Fort William there are a number of large engineering works of such a character than men are constantly made victims of flying steel chips and filings. Most large plants have their own eye doctor, usually a foreman or a workman who has become proficient at extracting specks of steel from the eye. At best this method is crude, and machinists often lose their sight through not receiving proper attention at the right time. This eye magnet is a valuable acquisition to the McKellar Hospital, and engineers in other cities would do well to urge their own hospitals to do the same.

Canadian Steel Trade.

Mr. J. H. Plummer, president of the Dominion Steel and Iron Co., has attracted considerable attention by his recent efforts to raise money in England to finance new improvements to the plant at Sydney. Speaking to the London correspondent of the Montreal Star, he expressed the opinion that the slackening of the Canadian iron and steel trade had been in imports rather than in manufacturing. The Canadian home demand, he said, was so large that there was little chance of exports to the United States. As for the United States tariff, he thought it a good thing to have this removed as it would provide a market at the door in case of dull times at home. Recent returns show the Dominion Steel

Corporation to be doing big business, but we know of other makers of steel who are crying out for business and cannot get it. Incidentally, the importation of American steel and iron continues almost unabated. An American firm secured a big order from the Toronto city corporation a week or so ago for an enormous amount of steel piping, while in the West it seems the proper thing for contracts to go to Pittsburg and the Western States. Last week, ten car loads of steel, consisting of sheets and plates were unloaded at New Westminster, B.C., for the Vulcan Iron Works, after being brought from Pittsburg, via New York and the Horn. If Pittsburg is able to secure the British Columbia trade now, how much easier will it be when the Panama Canal is opened for traffic?

Georgian Bay Canal Again.

There are two sides to most questions, and there are two sides to the Georgian Bay Canal question. Towns like North Bay and Ottawa take it very much to heart when cold water is thrown on this scheme, as these are the places which expect to reap a rich reward when the canal is constructed. On the other hand, towns and cities like Toronto and Welland, which deprive considerable profit from the Welland Canal, are never happy unless praising their own route to the West, and calling attention to the deplorable waste that would result from the canal further north. In Montreal, opinion seems to have been somewhat divided, and there are many in the metropolis who doubt the feasibility of the project. Nevertheless, the Montreal Board of Trade has deemed it wise to jog the Government a little on this matter. Having heard that a proposal is on foot to appoint a commission to enquire into the commercial feasibility of the scheme they ask that Montreal be given a voice in the appointment of its members. After discussing the matter at great length, the Board of Trade drafted a resolution and sent it to the Premier and the Hon. Frank Cochrane, stating that in view of the fact that Canadian grain for export is being diverted through American channels, it is of vital importance that the Georgian Bay Canal be constructed. It is there that the shoe pinches Montreal, because only for the Erie Canal, the present route would be entirely satisfactory to that city. If the Georgian Bay Canal were constructed, Montreal would benefit doubly.

The Coal Fields of Alberta.

Lots of people believe that, outside of the coal fields of Cape Breton and Vancouver Island, there is little coal to be found in Canada. Thus, it is somewhat startling to be told that 14½ per cent. of the total coal resources of the world, is in Alberta, estimated at 7,396,551,000,000 tons. Statisticians in the employ of the Alberta Department of Mines have estimated that it would take four million men, each producing five tons a day and working 300 days a year, 179 years to mine this immense field of coal. The output in Alberta last year was 3,500,000 tons, against 13,000,000 tons for the whole of Canada, including the Yukon. These are startling figures to those who have not followed the coal situation closely. They prove that the future of Canada, and especially the Canadian West, as a great manufacturing country is assured. Gradually industries which require coal and coke are opening up between Winnipeg and the Rockies, and gradually this big tract of coal is being opened up. The day is not far distant when Canada will mine her own coal, and a stiff tariff will be needed for protection.

Mayor Boosts His Town.

Mr. Bernier, M.P., the Mayor of Levis, Que., has been in London, Eng., studying shipping matters. Incidentally he has been giving the British shipping world a lesson on Levis, emphasizing the importance of the Government drydock being built there. This dock, which will be on the south side of the river, will mean as much to Levis as to Quebec, and the mayor has not been slow to appreciate the value of boosting. While in the British capital, Mr. Bernier took pains to advertise his town as a good site for manufacturing and shipping enterprises. Levis has several prosperous engineering firms within its boundaries, including a well-known shipbuilding yard, but with its leading machine shop it has been most unfortunate. During the last forty years it has been in several hands, the last being the Canadian Shoe Machinery Co. now in liquidation. There is some talk of a new syndicate taking it in hand. Under good management, and manufacturing a good line of machinery, it should do well, for it is well-equipped, and employs from 300 to 400 men. Under the last regime, shoe machinery and a variety of other lines were made. While there is a good market in Quebec and Ontario Provinces for shoe machinery, makers of this class of goods have not met with success, the competition from the United Shoe Machinery Co. being so severe. The Canadian Shoe Machinery Co. of Levis, is not the first concern of this kind to assign in the last few years. For some time George T. Davie and Sons, shipbuilders, have been using the shops to manufacture equipment for their yards.

A Point in Law.

J. W. Hamilton and F. Richfield agreed to form a company in Medicine Hat for the purpose of running a machine shop. The former supplied the funds, the latter supplied $3,600 worth of machinery, and became manager. The plant was known as the Industrial Iron Works. They endeavored to sell stock and form a joint stock company, but failed to dispose of that commodity. Hamilton, therefore, asked that the business be discontinued, while Richfield suggested that he operate the plant for a short time until a sale of stock could be effected, and agreed to pay Hamilton $50 a month interest on his capital. The plant was operated for two more months, and then Hamilton asked for a settlement and possession of the property. Richfield refused, saying he was acting for the company. Hamilton replied that no company had been formed, and that Richfield being his tenant, he could end their agreement when he liked. The case went to court, and the judge ruled that Richfield had no right to possession of the property, and gave him ten days in which to remove his machinery.

C.P.R. Car Output.

The turning out of 10 steel freight cars a day, and from 8 to 10 steel passenger cars a month, is the capacity of the latest addition to the Angus shops operated by the C.P.R. at Montreal. The new buildings for the construction of steel cars are now operating in full blast, and already over one hundred freight cars have been added to the Canadian Pacific Railway Co. rolling stock. Officials of the railway express appreciation as to the manner in which the new manufacturing equipment has been placed. In the month of April, work was started on the buildings, and, in the record-breaking period of five months, everything was completed and the first steel freight car turned out. By the end of September, the sixth month, 68 cars started in as freight carriers between the Pacific and the Atlantic oceans. The buildings consist of two structures 100 feet by 200 feet and 100 feet by 182 feet respectively for the manufacturing of both classes of cars, a building 72 feet by 405 feet for the exclusive manufacture of freight cars, and four buildings 226 feet by 208 feet for passenger car work. The blacksmith shop, wood mill, and wooden freight car shop previously used in the manufacturing of wooden cars and which had the capacity of turning out 32 cars a day, will be utilized in the work of steel car construction.

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Vol. X. NOVEMBER 20, 1913 No. 21

PRINCIPAL CONTENTS.

THE TRAGEDY OF OUR GREAT LAKES.

AS we go to press, there are still being unfolded the harrowing details of the greatest combination of disasters that has yet befallen the shipping on the Great Lakes of this continent. Ranking, in recent years, perhaps next to the foundering of the Titanic, 18 months ago, in general importance, but taking premier place and making record so far as Canada is concerned, in the matter of the loss of brave men and things material, we think it meet that reference should be made in the columns of this journal to the overwhelming sorrow which has taken possession of all of us, and to the sympathy we are constrained to extend to those bereaved, because of the untoward, and might we say unpreventable tragedy, in which they have been made participate.

You operative machinist readers are kin to the man on the starting platform at the tank top level, as well as to him who feeds the coal to the boilers, and we somehow feel that in this hour of calamity your pulse beats some faster when you realize that your brother, met his death doing his duty.

And what of the other men, equally faithful, whose duty demanded that exposure to the full fury of the blast on deck and bridge be their shroud!

EPIDEMIC OF BOILER EXPLOSIONS.

CANADA holds the world's record for fire losses per head of population, and if recent happenings are any criterion, she is out to secure the like unenviable reputation in the matter of steam boiler explosions. The latest of these constitutes a shocking record in both life and property, and the wonder of it all is that many more innocent and unsuspecting mortals were not hurled unceremoniously into eternity. The illustrations accompanying the article in another part of this issue give ample evidence of the material devastation wrought by the explosion. The official investigation is still pending, and may, on its conclusion, be expected to give us definite information, as to not only the ultimate, but contributory causes as well, of the disaster.

It should be needless for us to point out here, and in this age of engineering knowledge and practice that this latest or any other explosion is something that did not develop suddenly and then go off. A more or less extended period of probation and preparation preceded the eventuality, and just whether carelessness or want of regular qualified and expert inspection—Government or Insurance Co.,—indifference or negligence of proprietor, carelessness or incompetence of attendant, or an unfortunate combination of two or more of these preceded the explosion, it remains for a searching inquiry to unfold.

The demand for the encouragement and development of higher degree skilled supervision and operation of steam power plants as indicated by the desire for graded certificates is one that cannot be much longer ignored by the authority responsible for the legal enactment of same, and let us say here that the present requirement for an operative engineer's license is one of the most elementary, primary and uncomplimentary valuation of the man's work and possible achievements ever devised. It is, therefore, up to the operative engineer, if he would retain his self respect, to individually and collectively press this graded certificate question in season and out of season to a successful termination, and to actively campaign against the employment of men to operate and attend our steam boilers, who are so palpably ignorant of their work as to be incapable of acquiring the already referred to existent license, and who are a menace to the public at large and to the conservation of our created productive equipments.

We receive letters repeatedly from our subscribers relative to the employment of uncertificated incompetents, and we go on record by saying that such a state of affairs need not and could not exist, if efficient tab were kept by those deputed to attend to this particular feature. Something in the nature of an explosion is necessary we are afraid to both wake-up and shake-up the people interested.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

	Mont'l.	Tor'to.
Grey Forge, Pittsburg	.....	$14 25
Lake Superior, charcoal, Chicago	.....	15 25
Middlesboro, No. 3	20 00	21 50
Carron, special	22 50	.....
Carron, soft	22 50	.....
Cleveland, No. 3	20 00	22 00
Clarence, No. 3	20 00	21 00
Jarrow	.....	23 50
Glengarnock	......	26 00
Michigan charcoal iron	27 00	.....
Ferro Nickel pig iron (Soo)	.....	25 00
Victoria, No. 1	19 15	18 00
Victoria, No. 2	18 65	17 50

BILLETS.

	Per Gross Ton.
Bessemer billets, Pittsburgh	$21 00
Open hearth billets, Pittsburgh	21 00
Forging billets, Pittsburgh	26 00
Wire rods, Pittsburgh	26 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto	2.10
Steel bars, f.o.b., Toronto	2.15
Common bar iron, f.o.b., Montreal	2.10
Steel bars, f.o.b., Montreal	2.15
Bessemer rails, heavy, at mill	1.25
Steel bars, Pittsburgh	1.30
Tank plates, Pittsburgh	1.25
Beams, Pittsburgh	1.30
Angles, Pittsburgh	1.30
Steel hoops, Pittsburgh	1.50
F.O.B., Toronto Warehouse.	**Cents.**
Steel bars	2.25
Small shapes	2.35
Warehouse, Freight and Duty to Pay.	**Cents..**
Steel bars	1.80
Structural shapes	1.90
Plates	1.90

Freight, Pittsburgh to Toronto.

18 cents carload; 21 cents less carload.

IRON PIPE FITTINGS.

Canadian malleable, 40 per cent.; cast iron, 65; standard bushings, 70; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 77½; malleable, lipped unions, 65.

NAIL AND SPIKES.

Standard steel wire nails, base		$2 30
Cut nails	$2 60	2 65
Miscellaneous wire nails		75 per cent.
Pressed spikes, ⅝ diam., 100 lbs.		2 85

BOILER PLATES.

		Mont'l.	Tor'to.
Plates, ¼ to ½ in., 100 lbs.		$2 35	$2 30
Heads, per 100 lbs.		2 65	2 65
Tank plates, 3-16 in.		2 60	2 40
Tubes, per 100 ft.,	1 inch	9 50	8 50
" "	1¼ in.	9 50	8 50
" "	1½ "	9 50	9 00
" "	1¾ "	9 50	9 00
" "	2 "	8 75	8 75
" "	2½ "	11 15	11 50
" "	3 "	12 10	12 50
" "	3½ "	14 15	14 50
" "	4 "	18 00	18 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Stove bolts	80 & 7½
Machine bolts, ⅜ and less	65 & 10
Machine bolts, 7-16	60
Blank bolts	60
Bolt ends	60
Machine screws, iron, brass	35 p.c.
Nuts, square, all sizes	4¼ per lb off
Nuts, Hexagon, all sizes	4½ per lb off
Fillister head	25 per cent.
Iron rivets	60, 10 p.c. off
Wood screws, flathead, bright	85, 10, 7½, 10 p.c. off
Wood screws, flathead, Brass	75, 10, 7½, 10 p.c. off
Wood screws, flatbead, bronze	70, 10, 7½, 10 p.c. off

National-Acme "Milled Products."

Sq. & Hex. Head Cap Screws	65 & 10%
Sq. & Hex. Head Cap Screws	65 & 10%
Rd. & Fil. Head Cap Screws	45-10-10%
Flat & But. Head Cap Screws	40-10-10%
Finished Nuts up to 1 in.	75%
Finished Nuts over 1 in.	72%
Semi-Fin. Nuts up to 1 in.	72%
Semi-Fin. Nuts over 1 in.	72%
Studs	65%

Discounts, f.o.b., Montreal.

OLD MATERIAL.

Dealers' Buying Prices.	Mont'l.	Tor'to.
Copper, light,	$10 50	$11 50
Copper, crucible	14 00	13 50
Copper, uncr'bled, heavy	13 00	12 50
Copper wire, uncrc'bled	12 50	12 50
No. 1 machine compos'n	11 00	11 50
No. 1 comps'n turnings.	9 50	9 50
No. 1 wrought iron	10 00	9 00
Heavy melting steel	8 50	10 00
No. 1 machinery cast iron	13 00	14 00
New brass clippings	8 50	9 00
No. 1 brass turnings	7 25	8 00
Heavy lead	3 75	4 25
Tea lead	3 00	3 20
Scrap zinc	3 00	3 50

WROUGHT IRON PIPE.

The following are Toronto jobbers' discounts on pipe in effect from April 21, 1913:

Standard	Buttweld Black	Buttweld Gal.	Lapweld Black	Lapweld Gal.
¼, ⅜ in.	64	49	....	....
½ in	68	58	....	....
¾ to 1½	73	63	....	....
2 in.	73	63	69	59
2½ to 3 in.	73	63	72	62
3½ to 4 in.	71½	61½	70½	60½
4½ to 6 in.	....	....	71½	61½
7, 8, 10 in.	....	....	66	54
X Strong P. E.				
¼, ⅜ in	56½	46½	....	....
½ in.	64	54	....	....
¾ to 1½ in.	68	58	....	....
2 to 3 in.	69	59	....	....
2½ to 4 in.	....	....	66	56
4½ to 6 in.	....	....	64	56
7 to 8 in.	....	....	55	45
XX Strong P. E.				
½ to 2 in.	43	33	....	....
2½ to 4 in.	....	....	43	33

PRICES OF WROUGHT IRON PIPE.

Standard. Nom. Diam.	Standard. Price. per ft.	Extra Strong, Sizes Ins.	Extra Strong, Price per ft.	D. Ex. Strong, Size Ins.	D. Ex. Strong, Price per ft.
⅛in	$ .05½	⅛in	$ .12	½	$. 32
¼in	.06	¼in	.07½	¾	.35
⅜in	.06	⅜in	.07½	1	.37
½in	.08½	½in	.11	1¼	.52½
¾in	.11½	¾in	.15	1½	.65
1 in	.17½	1 in	.22	2	.91
1¼in	.23½	1½in	.30	2½	1.37
1½in	.27½	1½in	.36½	3	1.86
2 in	.37	2 in	.50½	3½	2.30
2½in	.58½	2½in	.77	4	2.76
3 in	.76½	3 in	1.03	4½	3.26
3½in	.92	3½in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4½in	1.27	4½in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.86	...	.....
7 in	2.38	7 in	3.81	...	.....
8 in	2.50	8 in	4.34	...	.....
8 in	2.88	9 in	4.90	...	.....
9 in	3.45	10 in	5.48	...	.....
10 in	3.20	....	.....	...	.....
10 in	3.50	....	.....	...	.....
10 in	4.12	....	.....	...	.....

METALS.

	Mont'l.	Tor'to.
Lake copper	$16 50	$15 25
Electrolytic copper	15 75	15 25
Casting copper	15 75	15 10
Spelter	5 35	5 50
Tin	41 00	41 50
Lead	5 40	5 15
Antimony	8.50	9.00
Aluminum	21 00	18 00

SHEETS.

	Mont'l.	Tor'to.
Sheets, black, No. 28	$2.85	$2.90
Canada plates, ordinary, 52 sheets	2.90	3.00
Canada plates, all bright	4.00	4.15
Apollo brand, 10¾ oz. (American)	4.30	4.20
Queen's Head, 28 B.W.G.	4.40	4.40
Fleur-de-Lis, 28 B.W.G.	4.20	4.25
Gorbal's Best, No. 28	4.40	4.40
Viking metal, No. 28	4.40	4.40

MISCELLANEOUS.

	Cents
Putty, 100 lb. drums	$2.50
Red dry lead, 5 cwt. casks, per cwt.	6.00
Glue, French medal, per lb.	0.10
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.26
Benzine, per gal.	23½
Pure turpentine	0.60
Linseed oil, raw	0.60
Linseed oil, boiled	0.63
Plaster of Paris, per bbl.	2.10
Plumbers' Oakum, per 100 lbs.	3.25
Pure Manila rope	0.17

COKE AND COAL.

Solvay Foundry Coke	$5.95
Connellsville Foundry Coke	5.80
Yough, Steam Lump Coal	3.88
Penn. Steam Lump Coal	3.68
Best Slack	2.99

All net ton f.o.b. Toronto.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents.

Montreal, Nov. 17. 1913.—There is little change in general conditions to report this week. Interest has been aroused in the news to hand on the 15th, that Mr. Plummer's mission to England had been successful in raising additional capital. The amount of the new issue is to be $3,500,000 five-year six per cent. secured notes of the Dominion Steel Corporation, due December 1, 1918, the issue price being 97.

The $3,500,000 now being offered is part of an authorized issue of $5,000,000; the balance may be issued at any time by the deposit of additional bonds of the Dominion Iron & Steel Company and the Cumberland Railway and Coal Company. The notes may be retired on any interest date at par on 60 days' notice.

The machinery trade jogs along at the same unexciting gait it has maintained for the past month or two. Dealers are kept fairly busy following up enquiries, but real live orders seem to be rather scarce. In woodworking machinery, however, things seem to be fairly brisk.

Specifications have just been issued by the National Transcontinental Railway Commission for lathes, planers, shapers and drill presses for their roundhouse at Grant, Ont. These are all to be motor-driven tools. The majority of the local machinery houses have not yet submitted their tenders on the equipment called for by the G.T.P. for Prince Rupert, and mentioned in last week's Canadian Machinery. It is likely to be some time before the orders are placed.

Mussens, Ltd., have just received an order for a Brown Hoisting Machinery Co. 15-ton locomotive crane. The purchasers are the Cook Construction Co., who will use it in their work on the new Montreal aqueduct.

Metals.

Trade is quiet in all metals. No further orders are being taken for English and Scotch pig iron, the last shipments of which for this season will be arriving this week.

Contrary to expectations, copper has continued to fall rapidly, the local price for electrolytic and casting copper being quoted at $15.75. New York and London market manipulators are thought to be responsible for this, and producers are said to intend reducing output until the price recovers.

Toronto, Ont., Nov. 18, 1913.—Signs are not very re-assuring in the steel business. Dealers are just beginning to see distinct signs of depression, and expect to feel it in three or four weeks from now, i.e., to feel the absence of orders for steel.

Foreign concerns, who usually leave the Canadian market alone, are coming in now, looking for orders, and their presence is having a disturbing effect on the market. These include American, German, and one English firm. They are mostly firms who want premiums when business is good, and will sell very cheap when business is bad.

Most of the current needs of established engineering concerns were covered several weeks ago, and recent activities of what might be called, spasmodic competitors have shown results more in disturbing existing contracts, than in developing new business. The efforts of Canadian steel concerns, and outside firms who are permanently represented here, are directed towards strengthening the market. Most of them saw this weakening of the market approaching, closed with their customers, so that outside competitors have come into the market to find most of the business closed.

There have been no very important reductions in price this week. There were slight reductions at Pittsburgh, but the only one here is in wood screws, which were dropped 10 per cent. on November 15.

Machine Tools.

The A. R. Williams Co. will move out of their premises on Front St., into the Copp-Clark Building across the way, this week. They have erected and equipped a boiler and blacksmith's shop, two storeys high, on Lake St., which will be used mainly for repair work. They expect to build on the lot between the Queen's Hotel and their present location.

They report collections better this month. The A. R. Williams Co. have found money hard to get, all summer, and particularly in October. November, so far, has been an exceptionally good month, the amount collected already being in excess of that collected in October.

The Canadian Fairbanks Morse Co. did considerable business when they exhibited at the Electrical Exhibition held at the Arena last week. They sold several large electrically-driven machines. Among their orders this week were two for 40 h.p. oil engines, one for Edward Trought, Inglewood, Ont., and another for L. A. Lindsay, Tapperville, Ont., both for grain grinding.

Metals.

No business was done last week in metals. One dealer said he might as well close up and go home. He could see nothing ahead. Orders for scrap iron from big steel companies are away down, indicating that business is slackening down in the steel trade. Prices remain the same.

Ottawa, Ont.—Contracts were awarded last Saturday by the Government to W. H. McGillivray, of Ottawa, for the Geodetic survey adjoining the Dominion Observatory, for $61,948; to the Polson Iron Works, of Toronto, for engines for the Lady-of-the-Lake being built at Sorel, $17,250; the Mergenthaler Co., New York, four linotypes for the Printing Bureau, $14,520; and to the Miehle Printing Press Co., Chicago, through the Toronto Type Foundry, presses, $8,407.

The Pas, Man.—The contract for building the power house has been awarded to Hunter and Dempsey, at $4,000. Work will commence immediately.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Engineering

Grand Forks, B.C.—The Grand Forks Garage Co. will build a $3,500 garage in the near future.

Virden, Man.—Cook & Doupe, machinists, have leased the business of W. Leverington.

Amherstburg, Ont.—The Amherstburg Garage Co. will build a garage on Dalhousie Street, costing $4,000.

Bradford, Ont.—A plant for making wire screens will be erected here by Watson-Smith Co., Ltd., Toronto.

Wabanum, Alta.—The Hunt Mfg. Co., Walla Walla, Wash., will erect a plant here to manufacture agricultural implements.

Windsor, Ont.—The Remington Arms Co. have given Wells & Gray, Toronto, contract for erecting a second building, costing $50,000.

Quebec, Que.—The C. N. R. shops at Limoilou will probably be considerably extended. Sir Donald Mann was here last week.

Brantford, Ont.—The core room of the Pratt & Letchworth malleable iron plant, which was destroyed by fire in April, has been rebuilt.

Galt, Ont.—The Galt Malleable Iron Co. have opened up two new departments, and will now make aluminum and brass castings.

Moncton, N.B.—It is understood that the Government will extend the I.C.R. car and locomotive shops here, the plant at present being over-taxed.

Sherbrooke, Que.—The Quebec Central Railway is building an engine house extension at Newington, Que. J. H. Walsh, Sherbrooke, general manager.

Mimico, Ont.—The ratepayers will be asked to approve of the action of the council in granting exemption of taxes for ten years to the Augustine Rotary Engine Co.

Winnipeg, Man.—The Winnipeg Ceiling and Roofing Co. have secured the controlling interest in the Edmonton Metal Works, Ltd., Edmonton, Alta., and will enlarge the plant and put in new machines for corrugating iron and other manufacturing work. W. J. Martin, Winnipeg, is president.

City Engineer Currie, of Ottawa, has deducted $680 from the contract price of an incinerator recently erected, owing to a delay of 34 days. The balance due is $7,982.50.

Quebec, Que.—The Eastern Canada Steel and Iron Works, Ltd., who were reported to be contemplating extensions, have decided not to increase their plant just now.

Sumas, B.C.—The plant of the Greene Manufacturing Co. has been sold to Christopher Robinson, a machinist, who has recently installed machinery at the American Mill.

Hamilton, Ont.—The National Steel Car Co., it is said, will start on the erection of an addition to their present plant, for the manufacture of all the interior decorations of steel passenger cars.

Brantford, Ont.—A syndicate has been formed, consisting of Fire Chief D. J. Lewis, Ald. Minshall, and Ald. Hollinrake, to make rotary engines, the invention of Wm. Gunston, of the Cockshutt Plow Co.

New Westminster, B.C.—The Heaps Engineering Co., Ltd., who have spent $37,531 on a new site on Lulu Island, are now negotiating a loan in England for the erection of the plant, which will cost $150,000.

Port Hope, Ont.—The Standard Ideal Co. have recently added four new enameling furnaces, and a second unit in the continuous pouring plant has been installed. A new warehouse has also been built.

Saskatoon, Sask.—Marshalls, Ltd., of Gainsborough, Eng., one of the largest manufacturers of farming implements in Great Britain, last week secured a building permit for an implement factory to cost $94,000.

New Westminster, B.C.—The Vulcan Iron Works, boiler makers, etc., recently received a consignment of ten carloads of sheets and plate from Pittsburgh. They have work for several months in hand. J. L. Duncan, manager.

Montreal, Que.—The Canadian Bronze, Ltd., has been incorporated at Ottawa, with capital of $2,000,000, to manufacture brass, castings, etc. at Montreal. Incorporators: Pearl R. Diamond, general manager, George C. Jones, etc., Montreal.

Gananoque, Ont.—Mitchell & Wilson have the roof on the new building they are erecting for the Ontario Steel Products Co. as an addition to their plant here. The new wing will be used for offices and machine shop.

St. Catharines, Ont.—The Lord and Burnham Co., of New York, makers of sash operating machinery and greenhouse designers, who have agreed to erect a branch factory here, will not have plans prepared until spring.

Montreal, Que.—J. H. Plummer, president of the Dominion Steel & Iron Co., has secured a loan in London of $3,500,000. Part of this will be used, it is said, to double the capacity of the Wabana ore plant in Newfoundland.

Galt, Ont.—B. M. Chittick, manager of the B. F. Sturtevant Co., Galt., says it will not be long before the plant is extended for the manufacture of electric fans and vacuum cleaners. At present only large fans are being made at Galt.

Brantford, Ont.—It is stated that the American Radiator Co. will extend its plant, and move its head office from Brantford to Toronto. W. S. Higgins has arrangements in hand.

Ottawa, Ont.—Instead of spending $50,000 on an extension to The Mint, the Government will take steps towards building a refinery, which will mean a much larger extension.

Sault Ste. Marie, Ont.—The ratepayers have voted to grant a bonus of $20,000 a year, for twenty years, to the Lake Superior Drydock & Shipbuilding Co., who will commence to build the plant on April 1, 1914.

St. Thomas, Ont.—The St. Thomas Bronze Co., Ltd., has been incorporated at Ottawa with capital of $200,000, to manufacture brass castings, etc., at St. Thomas. Incorporators: Pearl R. Diamond, general manager, George Clinton, etc., Montreal.

Vancouver, B.C.—J. O. McFarland, of Vancouver, Henry Hewitt, of Tacoma, Wash, and his son, have gone to Europe to secure capital to construct a blast furnace here or in an adjacent municipality. The Hewitts are said to have secured control of iron ore deposits in British Columbia, and to have arranged for a supply of coking coal. The new company will be capitalized at $15,000,000, it is said.

New Glasgow, N.S.—Robt. E. Harris, president of the Nova Scotia Steel and Coal Co., says that part of the proceeds of the $2,000,000 issue now being placed will be used in equipping a new colliery, a new open hearth furnace, and other plant additions.

Winnipeg, Man.—The North-Western Brass, Ltd., has been incorporated at Ottawa, with capital of $1,000,000, to manufacture brass castings, etc., at Winnipeg. Incorporators: P. R. Diamond, general manager, Darley B. Smith, manager, etc., Montreal.

Montreal, Que.—The Laurie Machinery Co., Ltd., has been incorporated at Ottawa with capital of $25,000, to carry on the business of dealers in machinery and supplies, and manufacturers of machinery, at Montreal. Incorporators: Walter Laurie, machinist, Alvin E. Woodworth, etc., Montreal.

Walkerville, Ont.— The Canadian Bridge Co. are putting in foundations for a 300 foot extension, which will be built next spring. This will be a structural shop for small work. The company will require punches, shears, cranes, etc. They themselves are contractors.

Oshawa, Ont. — The Bowmanville Foundry Co., Bowmanville, Ont., makers of stove trimmings and novelties, nickel and brass plating, etc., who, it was reported, would erect a new plant in Oshawa, will not be able to do so for some time, owing to unforeseen circumstances.

Londonderry, N.S.—Anthony McMillan, of London, and the Eastern Trust Co., of Halifax, have been appointed joint receivers of the Londonderry Iron and Mining Co. The Canada Iron Corporation is the holding Company of the Londonderry Iron and Mining Co., and owns the pipe foundry at Londonderry.

Windsor, Ont.—The Kelsey Wheel Co., a Detroit concern, have just completed a plant, next to that of the Canadian Sirocco Co., and will start operations within a week or two. They will make automobile and other wheels. Their special machinery has been made in the States, but their ordinary machine shop outfit will be purchased in Canada this week.

Electrical

Winnipeg, Man.—The city has secured a contract to supply light to Ward 4, Transcona, for $2,000 a year.

Port Moody, B.C.—The town has awarded a contract to the B. C. Electric Railway Co. for the installation of 30 lights.

Winnipeg, Man. — The Linton-May-Lush Electric Co., Ltd., have been incorporated as electrical engineers, with $20,000 capital.

St. Thomas, Ont.—The Dominion Government will establish an automatic fog horn, to be operated by Hydro-Electric current at Port Stanley.

Rosthern, Sask.—H. E. Shackleton, of Prince Albert, Sask., proposes to establish an electric light plant here if given a site and 10-year franchise. The council have taken a month to think it over.

Niagara Falls, Ont.—A report from Binghampton, N.Y., says that a power plant will be built costing several million dollars, on the Canadian side at Niagara Falls. Surveyors have already been at work, according to reports.

Fort William, Ont.—The Mount McKay and Kakabeka Falls Railway Co. offer to supply 1,000 h.p. to the city at $18 per h.p. The Hydro-Electric Commission offer 1,000 h.p. at $24, with substation and other equipment.

South Vancouver, B.C.—It is planned to build a municipal electric lighting and power plant at a cost of $300,000, and to generate current by steam turbines driven with steam generated in oil burning furnaces. A gas plant is also talked of.

Grenfell, Sask.—The opening of the electric light plant in the town of Grenfell took place on Monday, November 10. The steam engine was supplied by Ruston Proctor & Co., Lincoln, Eng., and the electrical machinery by the Canadian Westinghouse Co., Hamilton.

Victoria, B.C.—Part of the plant of the Vancouver Island Power Co. at Jordan River has been out of commission as a result of the washing away of the grade along which the flume line runs. In the meantime the auxiliary power plants are being operated to capacity.

Smithers, B.C.—Arrangements for the immediate installation of the first unit of the electric light plant have been made by W. J. O'Neill, and his associates. The power-house, work on which will begin at once, will be located on Fourth Avenue. The plant will supply 500 lights, and will be supplemented if not sufficient.

Peterborough, Ont.—The Electrical Power Co. has refused to accept the city's offer of $95,000 for the distribution system of the Peterboro' Light and Power Co., which is controlled by the Electrical Power Co. The city council has therefore, appointed R. A. Ross, of Montreal, as arbitrator in the proceedings which are to follow.

Sandwich, Ont.—The Sandwich town council has asked the Hydro-Electric Commission for information regarding the cost of installing the Hydro system in the town, and what a probable rate would be. Councillor O'Brien thinks that the town will get cheaper power from the Edison Company.

Niagara Falls, Ont.—The building of a suspended raceway to tap one-half of the waterfall from the Canadian Falls and one-half from the American Falls at Niagara River to a point where a power plant will be erected for the generation of electricity is the plan of Frederick Walker, No. 39 Broadway, New York. The raceway will cost about $2,500,000.

Hamilton, Ont.—The Dominion Power and Transmission Co. will build its steam plant to develop 90,000 h.p. near Stewart Park on the bay shore. It is rumored that the company will devote the surplus to operating electric lines, and that it will extend its H. G. & B. line to Niagara Falls, improve its H. & D. line and extend its B. & H. line to Galt.

St. Catharines, Ont.—The city finds 2,000 h.p. Hydro-Electric power insufficient for its needs. A new industry now being negotiated will require 1,000 h.p.

St. John, N.B.—A generating plant with a capacity of 500 h.p. is being installed in the new elevator here; also a small lighting machine of 50 h.p. The W. J. O'Leary Co. are in charge.

Toronto, Ont.—The contracts signed with the Hydro-Electric Commission for power by Owen Sound, Meaford, Thornburg, Markdale, Flesherton and Chatsworth will necessitate the construction of a transmission line to Collingwood, which will cost approximately $500,000. The Government will take the matter up at once, as well as provide money for the development plant at Eugenia Falls.

South Vancouver, B.C.—Electrical Engineer Rawden has urged the municipal council to establish a new system of street lighting. He stated that, with the present system, 100 arc lamps cost $4,500 a year to maintain, while 25 flaming arc lights, he said, would cost approximately $1875 to purchase, and $1,125 a year to maintain. He suggests that as additional lights are needed, 75 arc lights be replaced by 25 or 30 flaming arc lamps, and that the 75 ordinary lamps be distributed where most needed.

General Industrial

Ayr, Ont.—The Sand & Supply Co., a Toronto concern, will make brick at their pit here.

Hull, Ont.—An explosion at the Canada Cement Co.'s works on November 12 did $2,000 damage.

Bracebridge, Ont.—Garrett's tannery here was destroyed by fire last week. Mr. Garrett will rebuild.

Windsor, Ont.—An explosion wrecked the furnace and boiler of D. M. Ferry Seed Co. on November 11.

St. Marys, Ont.—The St. Marys Rock Cement Co. will add three rotary kilns to their plant before next spring.

Victoria, B.C. — Eastern capitalists have invested $300,000 in the soap works of W. J. Pendray & Sons, Ltd.

Ingersoll, Ont.—The Standish Mfg. Co. have awarded the contract for building a soap factory, costing $11,000, to Nagle & Mills, Ingersoll.

Quebec, Que.—G. A. Vandry, France, will take the biscuit factory of John Glass, and operate it if given a bonus by the city. He would employ 50 men.

Medicine Hat, Alta.—The Canada Cement Co. is building a $2,500,000 cement plant at Dauntless, a few miles south of Medicine Hat.

St. Thomas, Ont.—C. H. Caughell, manager of the St. Thomas Gas Co., says $40,000 will be spent on new mains, etc., shortly.

New Westminster, B.C.—Owing to exorbitant rentals, the St. Mongo Cannery Co. will probably move to Steveston, B.C., where a larger plant will be built.

Victoria, B.C.—Sir Wm. Lever has secured a controlling interest in W. J. Pendray & Sons, Ltd., makers of White Swan Soap, and new capital will be used for extensions.

Toronto, Ont.—The Harbor Commission have bought from David Elliott the Elliott Paper Mills property at 23 Fisherman's Island, to permit development work.

Levis, Que.—Efforts are being made to retain the J. B. Blouin & Co. plant for the manufacture of shoes, employing 140 hands, in this town. Inducements are offered by Sherbrooke to go there.

Cobourg, Ont.—H. R. Free's cheese factory at Centreton, near here, was destroyed by fire, November 13, at a loss of $1,500. There is some insurance. Mr. Free owns a circuit of cheese factories.

Bridgeburg, Ont.—The William Briscall Glass Co., who have been maintaining a glass plant in Buffalo, with a smaller plant in Bridgeburg, have decided to consolidate both plants here.

Calgary, Alta.—The Marshall-Izlar Supply Co., a new company who will carry supplies for building, railway, construction and mine development work, have opened offices in the Maclean Building.

Coaticook, Que. — The Barnston Woolen Mills Co. will move their plant here if given certain concessions asked. They will enlarge the plant, and take 40 h.p. electric power, and employ 70 to 80 hands.

St. Catharines, Ont.—The council have endorsed an industrial proposition on which negotiations are taking place. Two by-laws will be introduced shortly to help industries which will employ 200 men.

Transcona, Man.—The D. De Tergene Co. have secured a building permit for a factory to manufacture a preparation for cleaning metal and glass. The contractors, Head, Shannon & Head, have started work on the building.

Rouleau, Sask.—The Medicine Hat Sewer Pipe Co. have purchased an option on three quarter sections of land, the property of Matthew Wallace, two miles north of Rouleau, containing valuable white clay deposits suitable for earthenware pipes.

Victoria, B.C.—J. C. Pendray, managing director of the British American Paint Co., announces the acquisition of new capital which will be used for extensive additions to the plant. Branches will be established at Edmonton and Calgary.

Vancouver, B.C.—A fire, which raged 24 hours and did about $500,000 damage, broke out in the plant of the Imperial Varnish Co., and did damage to the plants of the Hotpin Electric Heat Co., Ontario Lantern and Lamp Co., and Mussens, Ltd.

Cobourg, Ont.—The Cobourg Dyeing Co. have purchased the old Matting and Carpet Company building, and are installing their plant. They will commence operations about April 1, 1914. John E. Hall, East Norwalk, Conn., will be the superintendent.

Toronto, Ont.—Mr. Justice Latchford has granted an order for the winding up of the Superior Portland Cement Co. The application was made on behalf of John McIntyre, a creditor to the extent of $29,260. The head office of the company is in Orangeville, Ont.

Medicine Hat, Alta.—Murdock McLeod, a Moncton, N.B., wholesale clothing manufacturer, has made arrangements to establish a factory to employ 30 hands. He will start the construction of a $10,000 brick building next April, and will manufacture clothing, overalls, hats and caps.

Vancouver, B.C.—The following are individual losses and insurance of firms which suffered by an early morning fire in the heart of Vancouver's business district, on November 16, which it is estimated caused a total loss of about $300,000:—Ontario Lamp and Lantern Co., stock $30,000, insurance $30,000, total loss; Chambers Brothers, stock $6,000, insurance $6,000, total loss; Donkin & Co., stock $15,000, insurance $15,000, total loss; Imperial Varnish Co., stock $40,000, insurance $40,000, total loss; Hot Point Electric Company, stock $10,000, insurance $10,000, total loss; Mussens, Limited, stock $15,000, insurance $15,000, total loss; David Spencer, Limited, stock $45,000, insurance $45,000, loss unknown; Kelly & Douglas, stock in building affected $150,000, insurance $150,000, loss unknown; Gault Bros., stock $300,000, insurance unknown, loss unknown, but mostly caused by water; F. Nicolas & Co., Limited, offices destroyed, insurance unknown, loss unknown.

Building Notes

Todmorden, Ont.—The School Board will erect a school to cost $100,000.

Victoria, B.C.—The Board of Governors of the University will rush work on two new buildings. Sharpe & Thompson are supervising the work.

Vermillion, Alta. — The Dominion Government is building a post office, Customs office and Dominion lands office at a cost of $70,000.

Wood Working

Saskatoon, Sask.—Fire on November 5 destroyed the mill of S. Kerr.

Sault Ste. Marie, Ont.—The Andrews Lumber Co., Ltd., are building several mills near here.

Toronto, Ont.—The Beverley Wood Specialty Co., Niagara St., will build a woodworking factory.

Wigwam, B.C.—The Lee Lumber Co. sawmill was burned October 30. The loss was about $30,000.

Victoria, B.C.—The Empire Lumber Co., a concern already established on Vancouver Island, proposes next year to construct a new mill at Osborne Bay, near Crofton. Vice-president C. C.

Young, of New York, announces that this new mill will be equal in capacity to the largest existing mill on the Pacific Coast. The company says the capacity of the new mill will be 250,000 feet daily.

Wyoming, Ont.—A sawmill will be built in connection with the box and basket factory being erected here by Dan Senecal.

Stoney Creek, Ont.—The Parry Sound Basket & Veneer Co. will erect a factory here for the manufacture of boxes, crates, etc.

Scott Junction, Que.—The Beauce Pulp & Lumber Co., Quebec, are considering plans for a new mill, to replace one destroyed by fire.

Rossland, B.C.—Mayor J. S. Deschamps will operate a mill at China Creek for two years on timber he owns in that vicinity.

Montreal, Que.—Fire broke out in the paint shop of the Dominion Iron Bound Box Co. plant on November 11, and did $3,000 damage.

New Westminster, B.C.—Mr. Darling, Industrial Commissioner, has secured a firm of American shingle manufacturers, who will build a large plant here.

Victoria, B.C.—Extensions to the mill of James Leigh & Sons, David Street, are contemplated, costing $6,000. The permit for the structure has been issued.

Hespeler, Ont.—The town is negotiating with T. Gettwalls, Grand Rapids, Mich., for the establishment of a plant for the manufacture of office fixtures and furniture.

Brantford, Ont.—The Reach Co., of Philadelphia, makers of sporting goods, are erecting a plant here, and the Spalding Co. may also erect a plant in Brantford for the same purpose.

Victoria, B.C.—Fire at Cumberland on November 14 in No. 8 mine of the Canadian Collieries, Mackenzie & Mann, caused a loss estimated at $40,000. The mill and machinery were a total loss.

Contracts Awarded

Hamilton, Ont.—The city has awarded a contract cable, amounting to $53,764, to the Standard Underground Cable Co.

Vancouver, B.C.—The Mannesmann Tube Co., of London, England, recently supplied the city with 80,000 feet of steel pipe.

Ottawa, Ont.—Tenders have been let for the new Government elevators at Moose Jaw and Saskatoon, and work is being rushed.

Hanley, Sask.—A contract has been awarded to the British Canadian Engineering and Supply Co. for a producer gas electric plant.

Niagara Falls, Ont.—The Hydro-Electric Commission has awarded the contract for an extension to their power house at Falls View to Wells & Gray, Toronto, for $7,000.

Toronto, Ont.—Chambers, McCaffrey and McGuigan, of Toronto, were awarded by the Cabinet Council last week, the contract for the construction of the Nassau dam on the Trent Canal. The contract price was $72,768.

Sarnia, Ont.—The Forest City Steel and Iron Co., Cleveland, Ohio, have received the contract for steel work for the new factory building, 180 x 280 ft., to be erected by the Perfection Stove Co. at Sarnia.

Estevan, Sask.—The town is adding to its plant two Babcock & Wilcox boilers fitted with Dutch oven furnaces for burning low class lignite mined in this district; also one compound quick revolution forced lubrication Goldie & McCulloch engine driving a Westinghouse alternator and exciter.

Winnipeg, Man.—The city engineer's department has been authorized by the Board of Control to purchase a centrifugal pump to raise the sewage from the low level of the McPhillips Street sewer at Aberdeen Avenue so that it will empty into the trunk sewer at Polson Avenue. The pump will be supplied by the Canadian Fairbanks-Morse Co. at a cost of $832.

Tenders

Yorkton, Sask.—Tenders are called up to December 22 for the supply of one 500 b.h.p. gas-electric unit.

Three Rivers, Que.—Tenders have been called by the city for the construction of a new ferry boat to ply between the city and the south shore.

Winnipeg, Man.—Tenders addressed to the Chairman, Board of Control, will be received up to November 21 for the supply and delivery of one 500 k.w. motor generator set for the King Street substation. M. Peterson, secretary.

Winnipeg, Man.—Tenders addressed to the Chairman, Board of Control, will be received up to November 25th for the manufacture and delivery of a quantity of weatherproof insulated copper wire. M. Peterson, secretary.

Ottawa, Ont.—Tenders for steel wire rope (tenders due December 1), steel and iron bars, sheets, plates and angles (tenders due December 3), copper and brass bars, sheets and tubes (tenders due December 15), will be received by C. J. Desbarats, Deputy Minister of Marine and Fisheries. Stores to be delivered at H.M.C. Dockyards at Halifax and Esquimault, B.C.

Ottawa, Ont.—The City Council will call for new tenders for building a hypochlorite station on Lemieux Island. Eight tenders for supplying hydrants were received, an dthe city engineer will choose the best.

Winnipeg, Man.—Tenders, addressed to the Chairman, Board of Control, will be received up to December 15th for the supply of two h.p. motor hose wagons, and a 75 h.p. motor aerial ladder truck. M. Peterson, secretary.

Victoria, B.C.—Tenders are now being called by the Dominion Government, to be in before the end of the year, for two piers, to be located between the Rithet pier and the breakwater. They will be 250 feet wide and about 800 feet in length.

Vancouver, B.C.—J. J. Warren, president of the Kettle Valley Railway, opened tenders on November 6 for the construction of the last stretch of the Kettle Valley. The distance to be finished is about 60 miles, west of Osprey Lake.

Ottawa, Ont.—Tenders will be received up till January 7th, 1914, for the construction of six 200-ton mechanical coaling plants with sandhouses complete at points on the National Transcontinental Railway. Plans and specifications may be obtained from W. J. Press, mechanical engineer, Ottawa, Ont. P. E. Ryan, Esq., secretary of the Commissioners of the Transcontinental Railway.

New Incorporations

Atlantic Oilfields, Ltd., incorporated at Ottawa, capital $600,000, to prospect for oil, etc., at Fredericton, N.B. Incorporators—Albert J. Gregory, John J. F. Winslow, etc., Fredericton.

Breslau Wood Products Co., Ltd., incorporated at Toronto, capital $25,000, to manufacture and sell furniture, at Breslau, Ont. Incorporators—James H. Dixon, Edmund H. Dedels, etc., Waterloo.

Fisher Motor Co., Ltd., incorporated at Ottawa, capital $600,000, to manufacture automobiles at Walkerville, Ont. Incorporators—Charles F. Garaghty, Detroit, Mich.; Frank Edgar Fisher, etc., Walkerville.

The Reid-Donald Steamship Co., Ltd., incorporated at Ottawa, capital $100,000, to deal in ships, vessels, etc., at Montreal. Incorporators—Walter R. L. Shanks, Francis G. Bush, etc., Montreal.

Vaudreuil Electric Co., Ltd., incorporated at Ottawa, capital $50,000, to carry on the business of an electric light, heat and power company at Vaudreuil Station, Que. Incorporators—Daniel P. Gillmor, Francis G. Bush, etc., Montreal.

Canadian Water Purifying Co., Ltd., incorporated at Ottawa, capital $40,000, to manufacture and deal in mining, milling, filters and general machinery at Montreal. Incorporators—Louis A. David, Louis J. M. Dugas, etc., Montreal.

Glengarry Construction Co., Ltd., incorporated at Ottawa, capital $100,000, to build and construct railways, canals, telegraph, telephone and electric power transmission lines at Montreal. Incorporators—Charles A. Pope, Gregor Barclay, etc., Montreal.

Municipal

Raymond, Alta.—The town will enlarge its reservoir next spring.

Mimico, Ont.—Carl Grobba is extending his waterworks which supply the town.

Nelson, B.C.—Ratepayers have voted in favor of purchasing the Nelson Gas Co. plant.

Brockville, Ont.—The municipal gas plant will be extended by the installation of new retorts.

Montreal South, Que.—The town council is considering a water and drainage system. Mayor Smillie.

Aylmer, Ont.—The waterworks and electric light department is in the market for a Duplex steam pump.

Swift Current, Sask.—The ratepayers will be asked to vote $15,000 for the installation of a fire alarm system.

London, Ont.—The present equipment of the London incinerator will have to be increased shortly.

Stratford, Ont.—The by-law to guarantee the bonds of the Avon Hosiery Co., which was defeated, will be re- ubmitted.

Port Arthur, Ont.—On advice of T. Aird Murray, the treatment plant of the new sewage system will be put in the south-west end of the city, and a pumping station will also be established. The expenditure will amount to $250,000.

Toronto, Ont.—A new water supply costing $100,000 is planned, and six miles of 6, 8, 12, and 16 inch mains will be required.

Galt, Ont.—The city will construct a large reservoir at the pumping station, and will require stand pipe and new mains.

Castor, Alta.—The ratepayers have voted $20,000 towards the completion of a gas well and extension to the gas lighting system.

St. Boniface, Man.—The ratepayers, on November 5, carried a by-law for $300,000 for sewer construction, and another for $50,000 for waterworks extensions.

Humboldt, Sask.—By-laws providing $103,547 for a waterworks system, $57,700 for sewerage, and $20,500 for extensions to electric light system, have been prepared.

Stamford, Ont.—The Jenckes Machine Co., St. Catharines, offer the council a standpipe without cement base, 16 ft. diam., and 80 ft. high, for $4,500. The town is installing a waterworks system.

Edmonton, Alta.—City Engineer Latornel has advised that both sides of the High Level Bridge passenger deck be wired at a cost of $4,000, with 1¾ inch galvanized iron netting.

Regina, Sask.—The Canadian West Natural Gas Co., represented by T. A. McAulay, has offered to supply natural gas in three years at 25 cents for power and 40 cents for domestic use.

Winnipeg, Man.—Representatives of the American Well Works of Aurora, Ill., A. W. McLean and Geo. W. Igo, were here November 13, in connection with the contract for the supply of a pump for some of the city wells.

Montreal, Que.—Fire Chief Tremblay reports that the new fire hall at 25 Drummond Street will be ready in the early spring. The city will equip this hall with a motor engine of 12,000 gallons pumping capacity; one hose waggon, and one ladder truck, costing $28,000.

Winnipeg, Man.—Surveying for the Greater Winnipeg water project has started, and as soon as the rights-of-way have been secured, a telephone line will be installed between Winnipeg and Shoal Lake. Actual construction will be begun next spring.

Ottawa, Ont.—It is probable that at the January elections Ottawa will vote on a proposal to establish a municipal gas plant. A special report presented to the council shows that the city can supply gas for 85 cents per thousand feet, as against $1.10 now being charged.

Refrigeration

Markham, Ont.—F. T. Newton has purchased a site for an abattoir.

Ottawa, Ont.—The ratepayers will vote on a civic abattoir proposition.

Lennoxville, Que.—Messrs. H. P. Hooper & Sons, of Boston, Mass., are contemplating the erection in Lennoxville of an up-to-date butter making plant and cold storage.

Quebec, Que.—The recently formed Quebec Abattoir Co. will build next spring. Representatives of the company are visiting other plants, getting suggestions. The company have decided to go into the canning business.

New Westminster, B.C.—The B. C. Packers' Association have informed the City Council that they do not wish to move the Columbia Cold Storage Co.'s plant to Steveston, B.C., but must be granted facilities by the city for erecting a new plant at once.

New Westminster, B.C.—Tenders for building a plant, to cost altogether $200,000, have been called by the Columbia Cold Storage Co., New Westminster, who will build their new plant in Steveston, B.C. The tenders received vary from $70,000 to $174,500.

Railways - Bridges

Steelton, Ont. — The International Transit Co., Sault Ste. Marie, are building a street railway here.

Quebec, Que.—The City Council has given the Champlain Realty and Elevator Co., who will build a passenger elevator from Mountain Hill to Frontenac Park, a 25-year franchise.

Ottawa, Ont.—The city and the Ottawa Electric Railway Co. will rebuild the bridge on Broad Street at a cost of $200,000. City Engineer Currie says it will be of reinforced concrete construction.

St. John, N.B.—H. M. Hopper, general manager of the street railway, announces that an agreement has been reached between the council of the parish of Simonds and the company, and that the car line will be extended to Crouchville before July 1, 1914, and later to Little River.

Ottawa, Ont.—E. E. Malone, chief engineer of the Ottawa and St. Lawrence Electric Railway, will build a double track line from Ottawa to the new Connaught Rifle Ranges, beginning next May.

Welland, Ont.—It is said that the Imperial Traction line, a proposed trolley route from Smithsville, Ont., to Bridgeburg, via Hamilton, which was supposed to have been started last May, will be started in the early spring.

Vancouver, B.C.—Sir Richard McBride, while in England, discussed Second Narrows Bridge with Sir John Wolfe Barry, the eminent bridge engineer, and several proposals will be considered by the Provincial Executive.

Victoria, B.C.—A committee composed of Aldermen Cuthbert, Porter, Meston and the city engineer, has been appointed by the City Council to inquire into the question of what shall be done to improve the present Rock Bay Bridge, or remove the present structure and replace it with a new and better arranged structure.

Regina, Sask.—Application will be made to the Provincial Legislature for the incorporation of a company, to be known as the Central Saskatchewan Railway Co., with headquarters in Regina, and branches to Saskatoon, Prince Albert, and the Manitoba boundary. The new railway will start with about 700 miles of road, divided among four branches, three of which will radiate from Regina. P. M. Anderson is solicitor for the Company.

Vancouver, B.C.—The contract for the work along the Coquahalla summit of the Kettle Valley Railway, of which J. J. Warren is president, has been let to Messrs. Armstrong & Morrison. This contract includes the boring of twelve tunnels and also a bridge across the Fraser River at Hope, giving connection with the C.P.R. at that point. It is estimated that the contract will run up to as much as $100,000 a mile in places.

Marine

Quebec, Que.—The transfer of the Quebec Steamship Co. to the R. and O. interests is expected to take place shortly.

Halifax, N.S.—Hon Robt. Rogers, Minister of Public Works, announces that the largest dry dock in the British Empire will be built on Halifax Harbor, probably on the Dartmouth side. He also states that he will give his support to the construction of a bridge across the Narrows, connecting Halifax and Dartmouth.

London, Ont.—Ald. Frank White and Fire Chief Aitken have been appointed a committee to purchase a steel boat for the fire department.

Ottawa, Ont.—The new ice breaker, for which tenders will be called in a few days by the Marine Department, will be the largest in the world It will be used on the St. Lawrence.

Collingwood, Ont.—The new steamer for the Pelee Island mainland route will be launched in Collingwood in December. She will have a speed of 15 miles an hour and will cost $70,000.

Welland, Ont.—M. Beatty & Sons have been awarded the contract to build a large dipper dredge for the C. S. Boone Dredging and Construction Co. of Toronto. The dredge, when completed, will be used on the excavation work of the new Welland Canal. It will be of five yard capacity, 100 feet long, 50 feet wide, and ten feet in depth, and will be of steel construction.

Collingwood, Ont.—According to A. A. Wright, general manager of the St. Lawrence and Chicago Steam Navigation Co., the new sister ship to the ill fated James Carruthers, which was lost on Lake Huron recently, should be ready to be placed in commission in time for the grain-carrying trade next autumn. The loss of the Carruthers is covered by insurance to the extent of $275,000 with the underwriters, and $150,000 in the insurance fund of the Company.

Trade Gossip

Moose Jaw, Sask. is is need of a city engineer. Applications should be sent to E. B. Bonnell, city clerk.

The Canadian Wire Co., Montreal, have changed their name to that of the Colonial Wire Mfg. Co., Ltd.

The Dominion Steel & Iron Co. expect to finish their new hospital at Sydney, N.S., by the first of the year. It will accommodate 50 patients.

The Auto Wheels, Ltd., London, Eng., will apply to the Parliament of Canada for an Act reviving the patent and extending the time within which they may commence to construct or manufacture in Canada the inventions patented under the same.

Foundry Convention and Exhibition.—We have received official intimation that the Conventions of the American Foundrymen's Association, The American Institute of Metals and The Associated Foundry Foremen, will be held simultaneously with the Exhibit of the Foundry & Machine Exhibition Co. in Chicago, from September 7th to 12th inclusive, 1914.

Siemens Co. of Canada, Ltd., announce that one of the Siemens Companies has supplied eight 150 k.w. sets, four per vessel, to the C. P. R. Steamships "Empress of Russia" and "Empress of Asia." The sets in question are driven by Belliss & Morcom engines. The Siemens Co. have also secured the contract for the electrical equipment for two further C.P.R. steamships now being built on the Clyde, by Barclay, Curle & Co., the generating sets in this case being six 100 k.w. and two of 16 k.w.

Personal

Vancouver, B.C., is advertising for an assistant waterworks engineer at a salary of $4,000.

F. C. Martin has been appointed superintendent of North Battleford, Sask., electric light plant.

J. A. Tilden, a machinery manufacturer from Boston, Mass., arrived in Vancouver last week on a business trip.

M. Rundlett, for almost two years Engineering Commissioner in Moose Jaw, has resigned his $6,000 a year position.

Robert Reford, of Montreal, the well-known shipowner who died March 15 last, left an estate of $2,912,486.

J. H. Hopp, formerly Canadian manager for Chas. W. Kawin, chemists and metallurgists, Toronto, is again in charge of the Canadian office.

Geo. Wedlake, superintendent of the Cockshutt Plow Co., Brantford, is mentioned in connection with the appointment of a Hydro-Electric Commission.

J. H. Bunting, joint manager of Bruce, Peebles & Co., electrical engineers, Edinburgh, Scotland, has been on a business visit to Montreal.

B. S. Foss, of Boston, president of the B. F. Sturtevant Co.; E. B. Freeman, secretary; and E. Elliott, Montreal sales agent, were recently in Galt, looking over the plant there.

A. T. Shortt, superintendent of the C.P.R. shops at Ogden, Alta., who has been laid up with an attack of appendicitis, has recovered and returned to his duties.

T. W. Kirby, of the Hamilton Stove and Heater Co., Hamilton, will move to Almonte, Ont., permanently this week, to take charge of the new Kir-Benn, Ltd., plant.

W. U. Bennett, vice-president of the Gramm Motor Truck Co. of Canada, Ltd., Walkerville, Ont., visited Winnipeg last week for the first time in twenty-three years. Needless to say he found a change.

H. J. Fuller, President of the Canadian Fairbanks-Morse Co., addressed the Science Undergraduate Society of McGill University, Montreal, on Wednesday, November 12, taking for his subject, "The Engineering Salesman."

J. W. Porter, who has been appointed by the Government to succeed John Armstrong as chief engineer of the Hudson Bay Railway, was originally employed by the C.P.R., but for some years and up to the present time has been engineer in charge of District B of the Transcontinental Railway, in Quebec City district.

John Armstrong, chief engineer of construction for the Hudson Bay Railway, has placed his resignation in the hands of the Government, who have accepted it. He has been in charge of the work for several years, and it is upon his reports and upon surveys conducted under his supervision that the route has been chosen to the Bay. He will do subcontracting for the line.

Book Reviews

The Bureau of Mines, of the Department of the Interior of the U. S. Government, Washington, has published a Miners' Circular No. 8 and entitled "First Aid Instructions for Miners." The descriptive matter is accompanied by a number of photographs showing methods of applying bandages, etc.

Safety Devices for Reducing Accidents to a Minimium

Staff Article

Employers and workmen are beginning to realize that the time has arrived when they should take a live interest in the prevention of accidents, and consider the subject, not only in relation to their own safety, but also as it affects the welfare of those dependent upon them. The writer of this article tells what Mr. George Bradshaw, safety engineer, has done along these lines.

THROUGH one reason or another, the work of the mechanic—using that term to cover all men who operate machinery, has become one of the most dangerous occupations outside that of railroading. Never a day passes but the Press in every part of the country records the death of or injury to a machinist due either to carelessness, defective machinery, or improper method of operation. As a rule the accident does not end there. If any fault lies with the employer, he has either to hand over a big sum of money to the man or his dependents, or fight the case in the courts. Both of these are distasteful, for besides meaning the loss of money, he is put to considerable worry and trouble, and much valuable time.

A step is now being taken towards reducing the number of accidents in machine shops and in every industry by systematic education of employer and employe in the causes of accidents. On the face of it this seems absurd, as it might be argued that anybody who looked for causes would find them easily. This is not so. After this system of education has been undertaken, it is common to hear heads of concerns say: "It's strange we have been going through these shops every day, and have never before noticed these dangerous conditions and practices." It is not strange at all, because this class of work has become a specialty. It requires an expert, just as it takes a bacteriologist to find fever germs.

This subject has been brought to the fore in Canada lately by the employment of George Bradshaw as safety engineer by the Grand Trunk Railway. He is a specialist in this work, and accepts contracts from railway and industrial corporations. During the time for which he has been engaged, Mr. Bradshaw will inspect the road, shops and other activities of this railway, and will report the conditions and practices causing, and most likely to cause injuries, and will make practicable recommendations for their prevention.

For the past ten years Mr. Bradshaw has been employed by two American railway systems—the Chicago & Northwestern and the New York Central—for the study of personal injury problems, through the patient and persistent investigation of facts. Certain conclusions were formed as to the correct principles of accident prevention. As a result of the application of these principles on the New York Central lines,

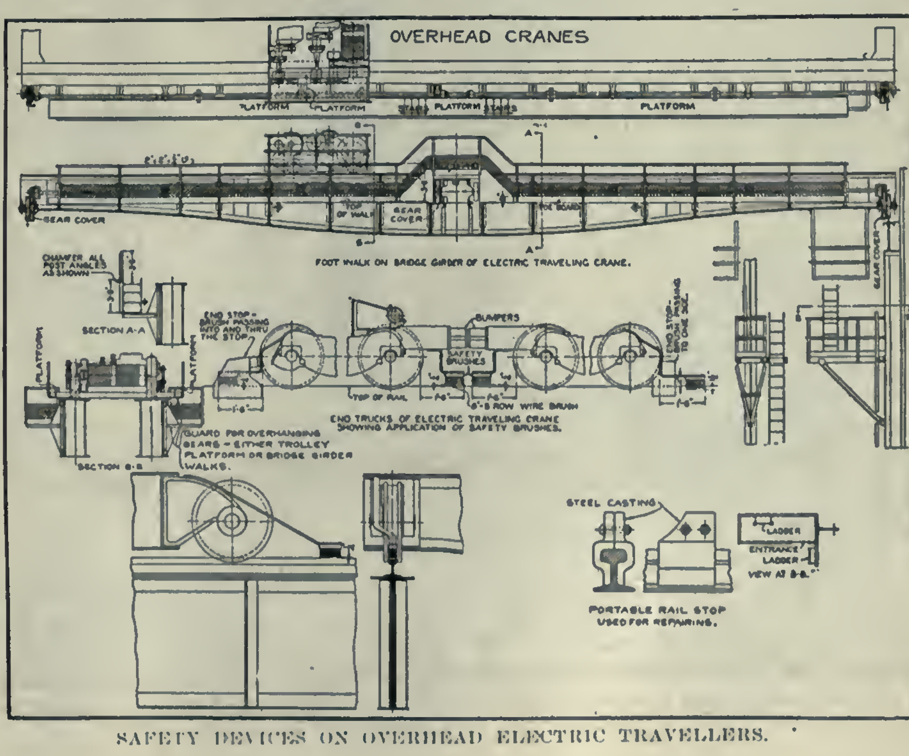
GEORGE BRADSHAW,
Safety Engineer.

the average decrease in injuries in the company's 18 shops, amounted to 42 per cent. Fatal injuries to employes decreased 15 per cent. during the last six months of 1912 as compared with the same period of 1911.

70 Per Cent. Less Injuries.

In the fall of 1911, the officials of a large New York corporation sought Mr. Bradshaw's advice on accident prevention in their plant, where many hundred men were employed. He studied their personal injury problem, inspected the plant, and made a report embodying definite recommendations. These recommendations were complied with, and in 1912 the record, compared with 1911, showed a decrease in injuries of 70 per cent., and a reduction in the personal injury account of 60 per cent.

Mr. Bradshaw and his assistants, when given a contract for the prevention of injuries, make a close study of the company's personal injury record, inspect the machines and shop conditions, and report where safeguards are required. They put into practice the devices evolved by work on the New York Central, devices which have been made standard in every shop on that system. They also tell and show employes unsafe and safe methods of doing their work. Much of the matter used in this article is the outcome of Mr. Bradshaw's work along these lines.

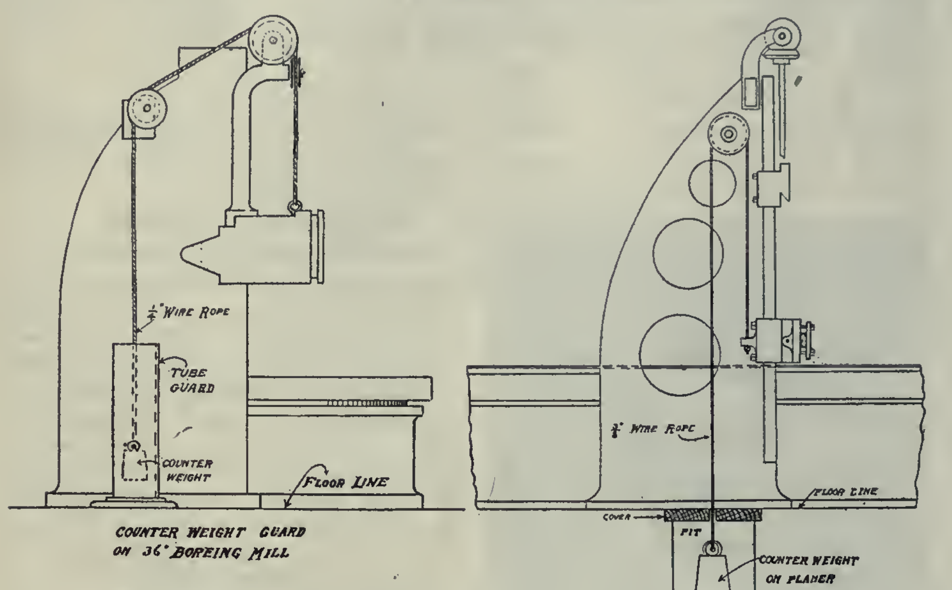


SAFETY DEVICES ON OVERHEAD ELECTRIC TRAVELLERS.

Cause of Accidents.

Broadly speaking, preventable accidents are due to three causes, or a combination of causes:

1.—Defective or improper condition of structures, equipment, machinery, tools or appliances.



COUNTERWEIGHT PROTECTION ABOVE AND BELOW FLOOR.

2.—Improper methods of work or operation.

3.—Failure of one or more men to use necessary care and diligence.

In other words, every preventable accident is due to some failure of material, method or man. Employes are not responsible for the first two causes, but they are for the third. Man, the human element, is almost wholly within the control of the employe. Material and method are subjects for official consideration.

The first step in the solution is absolute sincerity. The official must not forget that yesterday he was an employe, and the employe must reflect that tomorrow he may be charged with the official's duties. The remedies are:

1.—Improve and make safe defective conditions of structures, equipment, machinery, etc.

2.—Correct improper method of work or operation.

3.—Educate employes to use necessary care in the discharge of their duties.

By pursuing these three remedies intelligently and persistently, preventable accidents will be decreased materially. Most important of all, the employe must be educated and trained to obey rules. Officials may go on issuing rules, bulletins and notices, and the accidents will go on too, until the employe is convinced that he can do his work without accidents. It is the neglect of little things, not thought worthy of attention, that produces the bulk of preventable accidents. In many shops there are positive instructions to stop certain machines before attempting to oil or adjust them. Yet some men, sometimes piece workers who want to save every second, are continually taking chances, and often get chopped to pieces. There are men in shops who will deliberately remove safety guards from machines they are operating.

Safety Devices.

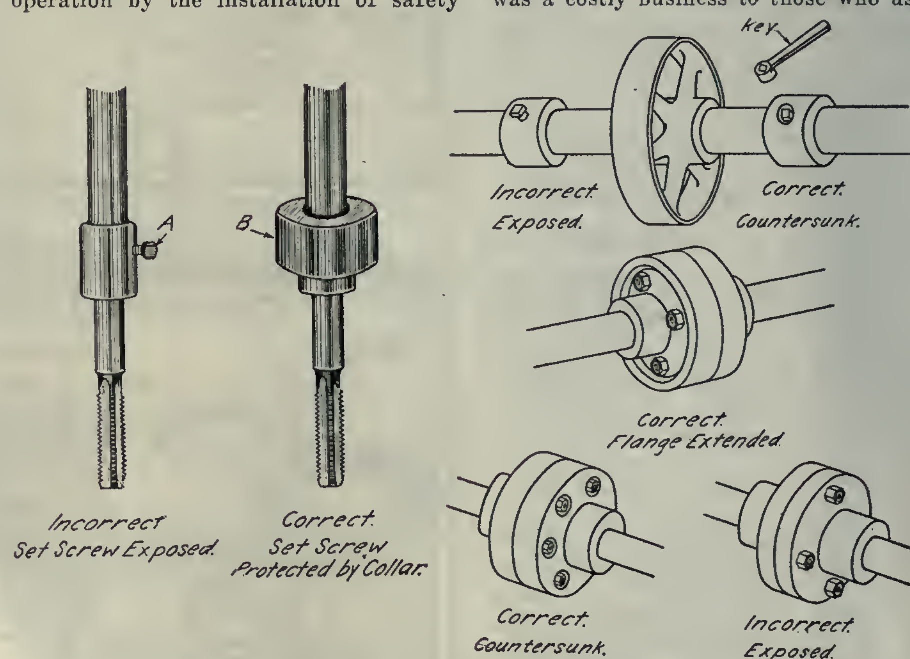
Fortunately, the remedies for accident prevention, so far at least as safety devices go, are numerous, easily applied and generally of little expense. Almost all machines, tools and appliances can be rendered reasonably safe for proper operation by the installation of safety guards and appliances, which, for the most part, can be constructed in the ordinary shop from scrap or other cheap material. There is hardly any limit to the extent of the application of these devices. Of course in the purchase of new machinery, it should be stipulated that all parts be guarded by the manufacturer to the fullest extent necessary. The proper time to apply safeguards to any machine is when it is made, but, until recently, manufacturers gave almost no attention to safeguards.

It must not be supposed from what has been said that the construction and application of safety guards is a matter of such simplicity as to require little thought and skill. Quite the contrary. In the first place, intelligent workmen—even foremen in charge—often need to have their attention called to the presence of danger and the necessity for guards. They are often entirely unconscious of dangers which confront them every minute of the day until some one points them out.

A heavy, sagging, and fast moving belt, running over a work bench, just high enough to clear the heads of the men at the bench is a common sight. The men are always liable to be caught by the sag of the belt, or struck by it if it should break. Protection may be afforded by placing immediately beneath the belt a wide plank, supported by brackets from the side wall.

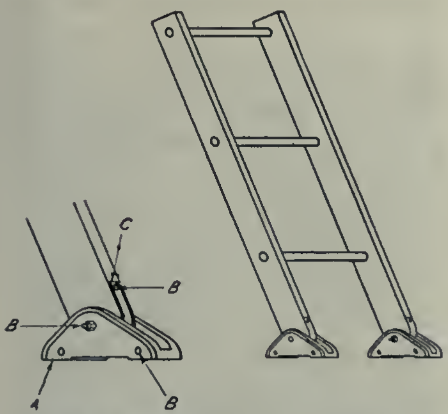
Dangerous Set Screws.

Set screws on revolving spindles, in such positions that the operator has to reach around the spindle to reach the clutch, are one of the commonest sources of serious accidents. Such an instance has only recently been engaging the attention of the courts of Montreal, and was a costly business to those who used the set screw in this manner. Workmen who operate machines with exposed set screws of this character, are liable to have their clothing caught, and their



EXPOSED SET SCREW DANGER.

arms broken. Often men are killed through this innocent-looking appliance. The unfortunate thing is that foremen and employers do not realize the danger of exposed set screws until a man is injured, and a thousand dollars or so has to be handed out for compensation. All set screws, nuts and bolt-heads projecting beyond the surface of the revolving



LADDER WITH SHOES OF BASSWOOD TO PREVENT SLIPPING ON SMOOTH FLOOR. A, METAL PLATE; B, BOLTS; C, METAL STRIP AROUND END OF LADDER.

parts, wherever located, should be counter sunk or protected by safety collars or flanges.

Wire Guards.

Gears at the end of lathes should be rendered safe by means of wire or sheet iron guards. As it is necessary to change the gears, the guard should be made to set on the floor and extend around the gears. Such a device can easily be removed. The only criticism that can be levelled against such an arrangement is that the operator is liable not to replace the guard. Where possible the guard should be attached to the machine by means of hinges. Gear wheels should always be guarded over the exposed parts, and both ends of the guard should be securely attached to the machine. Where the wheels are solid, rim guards may be used, these extending over the teeth.

Pulleys, flywheels, and other dangerous machinery near floors should be protected by a complete enclosure of wire of fine mesh or of sheet metal as well as by railing. Machinery in places where people have no business should also be guarded, as an injured careless man is almost as serious as an injured careful man.

A simple and effective device for preventing injury by flying chips from a machine, consists of a canvas bag, with a small area of glass for vision, held by movable support. Cloth is preferable for this purpose to other material, because it prevents the chips from rebounding. A screen of fine wire serves the purpose where it may not be desirable to use cloth.

Dangerous Ladders.

It is a common thing to see a man working around shafting, mounted on a cheap ladder which might at any moment be precipitated owing to the oily nature of the machine shop floor. In such cases, "spuds" should be used. Where the floor is of cement or of a material on which "spuds" cannot be used, then the ladders should be fitted with "shoes" made of basswood, which do not readily slip on cement or other smooth floors.

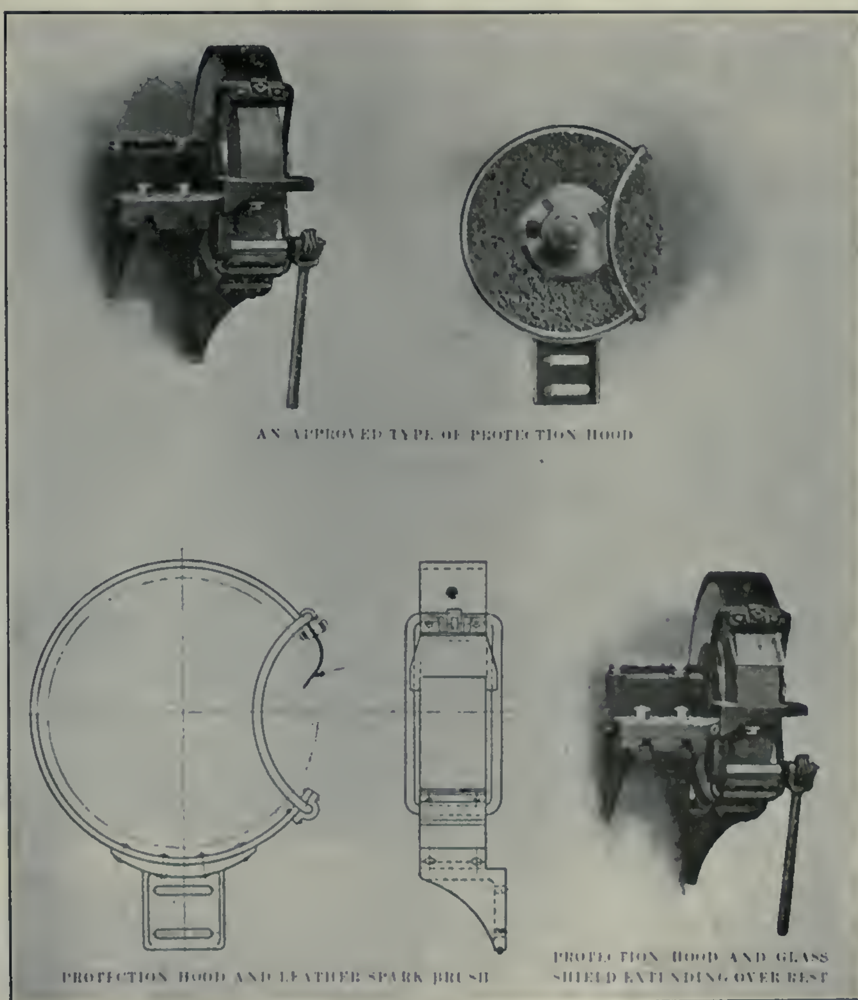
Machinists incur needless risk by the nature of the clothing they wear, which must necessarily come in close contact with movable parts of machines, all of which cannot be enclosed by guards. Loose, baggy clothing, especially sleeves, are liable to get caught by machinery and the operator drawn into the machine. Injuries due to this cause are by no means infrequent. Men engaged in this class of work should wear snug smooth-fitting apparel with short sleeves. Rings should be removed from the fingers and watch chains not permitted on outside of clothing.

When material is being raised or lowered over a passageway in a workshop where employes are accustomed to walk, the floor space should be railed off where there is danger. It is not sufficient to depend on signs warning men of the danger. If the hoist is of a permanent nature it should be properly protected. If of a temporary nature and not protected, someone should be stationed to see that employes do not walk in the danger zone.

Defective Floors.

Little mistakes often result in the most serious consequences. When a floor is being repaired, the hole should never be allowed to remain unguarded. An instance is known in which a man pulling an iron horse across the shop stepped backwards into such a hole, and the horse fell on him, killing him. In shops where large numbers of men are employed, defective floors are a menace.

In plants where there is a gallery over-head for the storage of supplies or for anything else, a toe board should be used to prevent anything falling on to workmen below. This should be provided on all balconies, scaffolds or platforms where men are employed beneath. It is a very simple device, but might mean the saving of a man's life, and a big sum to the company.



AN APPROVED TYPE OF PROTECTION HOOD

PROTECTION HOOD AND LEATHER SPARK BRUSH

PROTECTION HOOD AND GLASS SHIELD EXTENDING OVER REST

EMERY WHEEL PROTECTION.

A common cause of injury in shops and roundhouses is stumbling and falling over material, tools and rubbish left in aisles and passageways. An air hose will cause a shopman while hurrying along, to trip and fall injuring his knee. This is only one more of the many instances of how little things to which ordinarily, slight attention is given, may cause serious results. It is not at all a difficult matter to keep aisles and passageways clear if all employes in the shop have their attention called to the necessity of doing so. Throwing things down anywhere is a bad habit which should be avoided in shops as elsewhere. Besides, more work can be done in a shop where employes can move freely without having to pick their way to keep from stumbling.

END GEARS OF LATHES.

EXPANDED METAL GUARD.

Danger Signs.

Danger signs mounted on posts should be kept around the shop so that employes who have work to perform around shafting may place the sign near the foot of the ladder before ascending. Danger signs should also be provided for dangerous electrical terminals and switches intimating that the guards are not to be removed except by experienced electricians. In the case of machinery which cannot be repaired or oiled while running, a metal sign, with red enamel face and white letters, bearing the following words: "Stop this machine before repairing, oiling or wiping," should be attached to the machine by screws.

Unfortunately, a printed sign as a means of calling attention to danger, is very unsatisfactory. It requires too much space, and cannot be read by any except English-speaking workmen. What is required is a simple, distinctive and suggestive symbol, adaptable to all places, and under all conditions. Care should be taken not to use warning signs except where there is a real danger.

In some shops, guards are painted red. This should not be done to indicate danger, because if the guards have been properly designed and applied, there should be no danger. If this practice has any merit at all, which is questionable, it merely serves to render the guards conspicuous, thus, perhaps, enabling the foreman, in passing through the shop, easily to observe any guard out of its proper position. It is not advisable to apply a special color to the guards, but to use such indication, or some sign or symbol, only upon those parts of machines or at those places in the shop which, by reason of construction or environment, cannot be made entirely safe by guards.

In boiler and machine shops one often sees a man striking with a hammer the head of a chisel or punch taken from an air hammer. He probably has no regular chisel or punch handy, and wants to save time and trouble in getting one—which he may do at the expense of the loss of an eye. Tempered steel is hard and chips readily, and the chips sometimes fly with great force. Every experienced machinist knows this to be a fact, but the records show that they are continually taking chances and getting hurt. This is one of the "little things" which should be explained to every machinist helper when he enters the service.

GUARDS FOR FLYWHEELS AND PULLEYS.

Injury to the Eyes.

A large proportion of all injuries received by shop employes are eye injuries, frequently of a serious nature, resulting in permanent impairment or total loss of vision. The most common cause of this class of injury is to be found in flying particles of dust, sparks, chips and similar objects. Experience has shown that these injuries are almost entirely preventable by the use of a few simple and inexpensive devices supplemented by personal caution on the part of employes.

Eye injuries can be almost entirely eliminated by wearing suitable goggles. For emery wheel operators, any ordinary style of goggles will do, since the only purpose is to keep dust from the eyes. For the other classes of service mentioned, only those goggles should be used which have been specially constructed for the purpose which require, among other things, lenses of sufficient thickness, strength and adaptability and flanges to prevent flying chips from entering the eye from the side. Whether furnished by the employer or employe (in which the custom is not uniform) each employe should have his own individual pair, as the wearing of goggles in common may spread diseases of the eye.

Emery Wheel Guards.

Guards for emery wheels should be

made of strong metal (preferably boiler plate) so as to retain pieces if the wheel should break. The guard should completely enclose wheel (sides and rim) except necessary grinding surface, hinges being provided when necessary to remove the guard. Large wheels should be provided with exhaust for sparks and dust. It is very important that the rests be kept in the proper position.

BAND SAW GUARDING.

Experience shows that the breaking of emery wheels is frequently caused by the rest being too far from the wheel, thus allowing material to become wedged between the rest and the wheel. Flanges for emery wheels should be concave—never flat or convex—and of from one-third to one-half the diameter of the wheel to which applied.

Dead Shafting.

All unnecessary dead shafting should be cut off. When necessary to retain dead shafting, it should be covered by a tube of smooth surface, of good and sufficient material. This tube is secured in a proper manner so that it will remain firmly in place around the shafting.

Counterweights above the floor should be enclosed in a secure casing. The pits for counterweights below the floor should be provided with a secure and safe cover.

Electric Shock.

Injuries are not infrequently due to shock from electric switch levers. These can be entirely prevented by completely enclosing the lever and points of contact by a box guard, which can be very easily made. The enclosing material should be metal to conform to the requirements of the Board of Fire Underwriters, and should be attached securely by bolts and not by hinges, a slot being allowed for projection of the lever.

Cranes.

Overhead cranes should be provided with runways the entire length of the bridge.

A safety switch should be placed on the bridge of the crane, the switch being such that, when pulled out, all power is cut off.

Sweep brushes, extending out from the truck wheels, should be placed on cranes, sweeping the rails, the purpose being to warn a person holding on to the rail of the approach of the crane.

Trolley wires entering the crane cable should be insulated.

Foot gongs should be placed on cranes.

Bumpers should be placed at the end of all overhead crane runways.

Where there is more than one crane operating on a runway, each crane should be provided with temporary stops to be attached to the rails for the purpose of isolating a crane while repairs are being made on same.

Walks should be placed, wherever practicable, on buildings parallel with crane runways.

Stairs, or iron ladders terminating in a platform, should be installed as a means of getting to the crane.

Provision should be made to prevent overhanging gears from falling below should they work off the shaft. This may be done either by attaching a platform, equipped with a tight fence at the sides and ends, to the crane trolley, or by putting a walk on each of the bridge girders the entire length of the girder. The fence on these walks should be made of angle iron, with a guard plate at the base of same, and the section between the guard plate and the middle railing should be enclosed with either heavy wire mesh or plate. The construction of this protection should be such that a wheel falling on it cannot roll off.

Hoist limit switches should be placed on cranes where practicable.

Cranes should be equipped with load, motor and foot brakes. Plungers and weights of brakes should be so encased that they cannot fall should the supports break.

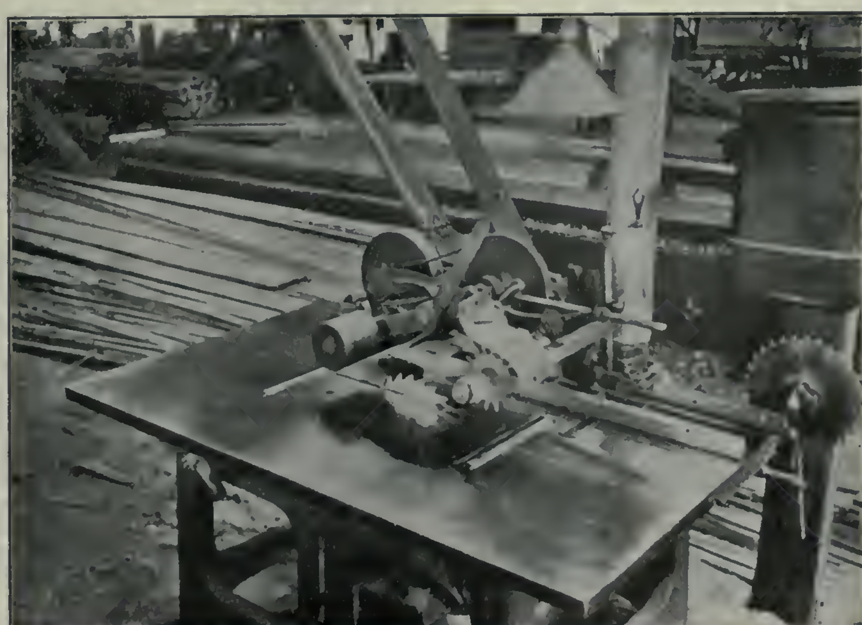
Each crane should be provided with a red lamp, to be used as a danger signal when the crane is down for repairs. This signal should be so placed as to be visible from all approaching cranes.

Dinkey or open-type controllers should be provided with an asbestos-lined steel guard over the movable contact parts, to protect the operator's eye from flash.

A box or other receptacle should be placed on cranes or runways, in which to keep oil cans, tools, etc.

Limitations of Safety Devices.

In any systematic plan for accident prevention it should be kept in mind that while safety devices are necessary and important, they afford the means of preventing only a small percentage of accidents. Important as these devices are, too much has been expected from their use. If all men, at all times, were as careful and prudent as they could be, there would be little need for safety devices. The necessity for such devices is in inverse ratio to the careful and prudent habits of those by whom the devices are to be used. Indeed, there is in theory this objection to safety devices, that they tend to eliminate the necessity for personal thought and alertness. In other words, if it were possible so to cultivate the human element in machine shops without reduction of out-



FEED WHEELS FOR SAW PROTECTION.

put or other detriment, so that accidents would be prevented, this method would be preferable to the use of safety devices, but as we cannot improve the human element to this ideal extent, we use safety devices to accomplish the purpose. They are at best but "devices" and their effectivenes for safety depends upon the intelligence and willingness with which they are applied and used.

Dont's for Machinists.

Don't try to shift a moving belt by hand.

* * *

Don't fool with electricity. It is dangerous.

* * *

Don't wear loose, baggy clothing, where it is liable to be caught in machinery.

* * *

Don't forget to replace all guards when through repairing a machine.

* * *

Don't neglect to report unsafe conditions to your foreman or superintendent. It is your duty, as well as your protection.

* * *

A guard is placed on a machine solely for your protection. Don't operate the machine without the guard in place.

* * *

Stop machine before oiling, wiping, or repairing it, and don't try to operate a machine you do not understand.

* * *

Don't swing a sledge or hammer that you know is working loose on the handle, thinking it won't come off till "next time." You may not be hurt, but "the other fellow" may.

* * *

Don't expect your helper to be as good a mechanic as you are. He isn't, or he wouldn't be a helper A little explanation as to the way the work is to be done may save injury to one or both of you.

* * *

If you know of some machine not properly guarded, don't wait till someone gets hurt and say, "I told you so." Tell the man in charge of the shop before an accident happens, and ask him to supply a proper guard.

* * *

Don't strike tempered steel with a hammer.

* * *

Don't go between or reach between large fast-moving belts.

* * *

Don't leave tools, material or rubbish between aisles or in walk-ways.

Don't wear loose, baggy clothing while working on or about machinery.

* * *

Don't throw boards or other material aside with points of nails extending upwards.

* * *

Don't think because an accident has not happened, it won't happen.

Reminders.

Belt shifters should be used on all pulleys where their use is practicable.

* * *

Secure railings ought to be provided, where practicable, for all stairways and platforms which are five feet or more above the floor or ground.

* * *

All switchboards should be guarded by a suitable gate or fence between the switchboard and the wall when located near wall.

The company by which you are employed wants you to take the time—the company's time—and do your work in the safe way.

* * *

After an accident has happened it is so easy to think how it could have been avoided. Try to think about prevention before "something happens."

* * *

Unsafe practices on the part of employes cause three times as many injuries as unsafe conditions.

* * *

It does little good to have safe machines, tools and equipment if you don't have safe men to operate them.

* * *

An injury to an experienced man means that a new man must take his place. A new man is always an experiment.

PULLEY AND BELT GUARD.

Runways at least 24 inches wide should be provided for all over-head oilers; protected, where possible, on each side and at the end by a railing thirty inches high.

* * *

All wheels with spokes or holes located at or within 7 feet of the floor should be guarded so as to prevent spokes or openings in wheels from catching material, clothing or persons.

* * *

All passageways and gangways in shops, depots, and storage houses should be kept smooth and in good repair and free from nails, materials, tools, etc.

* * *

It is better to be careful a thousand times than to be crippled once.

* * *

Check yourself up on unsafe practices. Get the "safety habit."

* * *

When "safety first" causes a delay, it is worth it and time well spent.

A factory inspector chained to every machine in the shop wouldn't keep some men from getting hurt.

* * *

It's easier to do a thing right than to explain why you did it wrong.

* * *

A minute of judgment is sometimes worth a day of energy.

* * *

You have no right to take chances. The other fellow may have to take the consequences.

* * *

To be careless, thoughtless, or reckless means injury sooner or later to yourself or others.

Resolved.

I will work for my company as I would want one whom I might employ to work for me. I will protect myself, those dependent upon me and my fellow employe from the risk of unnecessary chances. I will do my part to reduce the number of personal injuries in the days to come.

Constructive Criticism Relative to Machine Tool Design*

By Edson R. Norris **

The Author of this Paper deals with a number of features in modern machine tool design which do not always contribute to the best interests of the user, and suggests as a basic condition towards offsetting the existing tendency that machine tools should not be designed to compass a wider range of work than their operators are called upon to perform, but that they should be equipped with such automatic devices as will decrease the operative skill required or reduce the operating cost.

IN recent years machine tool builders have been active in taking advantage of the many improvements sugg-sted in the way of special devices, attachments and accessories for machine tools for the purpose of increasing the usefulness of the tools, lessening the cost of production, and in some cases reducing the skill necessary to operate. It is the object of this article to consider some of these special features from the standpoint of the large user of machine tools, yet giving due consideration to the demands of others whose requirements are different and whose lines of work are also often diversified in nature. The subject cannot be discussed without taking into account to some extent the designs of the tools, and what might appear as adverse comment in the illustrations of apparently faulty designs is merely offered in the way of constructive criticism.

Purchase Considerations.

It may be said that ordinarily the following reasons and conditions prompt the machine tool user to purchase equipment:

1.—To take care of an immediate increase in business.

2.—To provide for anticipated increase in business, and at the same time to reduce the cost of manufacture by replacing existing tools with more efficient ones.

3.—To replace worn-out tools with tools of the same design.

All large progressive concerns expect to and generally do expand, either by increasing their business along existing lines of manufacture or along similar lines, and frequently this increase occurs so suddenly that immediate action must be taken in purchasing the necessary tools to take care of the extra requirements. When this condition arises, the purchaser must quickly decide what machines will be required, and endeavor to purchase those that can be delivered promptly and which will do the work intended in an efficient and economical manner.

General Purpose Tool Feature.

It is often found, however, that while the machines offered for prompt delivery will perform the work desired in a satisfactory manner from a time standpoint, they are also designed and equipped to do a still larger class of work, and if installed the investment is greater than it should and would be for the work intended, if time would permit the installation of special machines. The fact that the fully-equipped general purpose tools are valuable and a good investment both for the large and small manufacturer, when the work is brought through in small quantities and the machining requirements vary, has no doubt a tendency to encourage the machine tool builders in some cases to carry only as their standards fully-equipped tools (or nearly so) capable of doing a wide range of work, feeling that as long as this situation exists the demand will warrant such a policy and that it would not pay to carry a line of cheaper and simpler tools.

When machines are considered to take care of an anticipated increase in business and to improve manufacturng conditions by replacing existing tools, the purchaser generally has the time to give the proper attention to the design and character of the machines needed, and it is almost unnecessary to say that he frequently decides to instal special or single purpose tools when the machine tool builders have nothing else to offer but expensive general purpose tools.

Automobile Manufacture Tendency.

The history of the automobile business in regard to machine tool requirements, if reviewed, will show that, when the business first started, machine tool builders had no difficulty in selling standard tools for this service, but as the business reached a sounder footing and time permitted giving more attention to the methods of manufacture, it was found advisable in a great many cases to demand machines capable simply of performing particular operations, or similar operations to those for which they were intended.

This has prompted some machine tool builders so to design their tools that they can now supply not only this demand, but also the demands made upon them for tools equipped to do a wider range of work. The attention of the writer was recently called to an instance where this had been done in the redesigning of a horizontal boring and drilling machine so that it could be offered simply for boring operations, and not as a high-class precision tool. The machine was arranged with a reasonable number of changes in feeds and speeds, and as a jig would be depended upon for accuracy of the work and duplication of parts, the spindle of the machine merely acted as a driver and feeder. The machine was designed for either belt or motor drive.

General Product Tendency.

What has been said regarding the tendency of automobile builders in ordering tools is also true of other large manufacturing companies, but possibly not to so marked a degree, because their products are not so well standardized or defined. This condition was very apparent in placing about $100,000 worth of medium-sized machine tools in a new factory for a line of work which is manufactured in large quantities.

It was advisable for several reasons to provide direct motor drive for all of these tools, and an effort was made to do so, but it was soon found that this could not be accomplished with all the machines that were considered desirable to use on the work and could be supplied promptly. For instance, some of the engine lathe and milling machine operations necessary in this work are of a light and simple nature, which can be done economically on stud lathes or cone type millers; in most cases, therefore, the standard lines of motor-driven engine lathes and high-power milling machines were considered too expensive to instal, which, of course, prevented carrying out the idea of motor driving all of the tools as originally desired.

Standard or Fully Equipped Tools.

It can readily be seen that it is not generally considered desirable or profitable to use so-called "standard or fully-equipped tools' on a line of standard apparatus. While it is appreciated that it is to the machine tool builders' interests to make their standard lines of tools serviceable for as many purposes as possible, in order to be able to meet the different requirements of a majority of their customers, they should also aim to make the designs so that the tools can be sold without the attachments and special features if not required for the work intended. They should either do this or else they should carry a line of

*From a paper read at the recent National Machine Tool Builders' Association Convention in New York.

**Director of manufacturing operations, The Westinghouse Electric & Mfg. Co., Pittsburg, Pa.

machines of simpler design, which can be used on the general run of commercial work.

The User's Viewpoint.

Machine tool builders very often show machine tool users by time studies or actual demonstrations in connection with a special piece of work that the time taken can be lessened by the use of their particular tools, and in such cases from the machine tool builders' standpoint, there is no reason why advantage should not be taken of this gain. With the user, however, this is not the entire proposition, especially if his production will permit him to use the machine in question continuously on such a line of work, which is very often the case. Under this condition any special features or attachments other than those actually needed for the work in question are of no value to the user and on account of the high purchase value, the saving in time does not warrant the extra investment.

Cases of this sort are very common, and are discouraging to those endeavoring to be progressive by aiming to take advantage of some of the new machine tools offered, and while machine tool builders deserve a great deal of credit for the great advancement made in the designs of their tools for the purpose of producing work rapidly and accurately, it seems that in their efforts to do this they have overlooked the fact that in some lines of manufacture these tools are too expensive to use. Simpler designs embracing some of the modern features will often do just as well.

Typical Examples.

These points can probably be made clearer by referring to a certain machine the Westinghouse Electric and Mfg. Co. has found very useful for its needs, and of which it has about two hundred in operation. The builder of this tool has, however, more recently developed a fully-equipped tool with all of the modern attachments, making it very advantageous in some instances, but which naturally is higher priced. He intends to discontinue the manufacture of the old machine, yet it is very evident that, on certain classes of work, the older type is just as desirable, and on other classes, the advantage of the new tool is negligible, because of the difference in purchase price of the two machines. It would be to the interest of the user to have this old design of tool improved to some extent, and it would likewise be profitable to the manufacturer, without in any way discrediting the value to both parties of the new type of tool.

In another case, the machine tool builder in his effort to produce a simple tool for a certain line of work did not take advantage of some of the modern attachments which would have improved his tool from an operating standpoint. The changes in feeds were cut down to what was considered the required amount for the service intended, but to change the feed it is necessary to remove and replace change gears. It can readily be seen that a modern change feed attachment would have been far more desirable. The value of this machine to the user also could be increased if it were equipped with a rapid traverse for the carriage.

Another tool recently installed to improve the quality of work and reduce the cost, lacks a certain modern feature, which makes the machine more laborious and more expensive to operate, and it will have to be equipped with this attachment to meet the cost of doing the operation under the old method.

Motor Driven Tools.

The demand for motor-driven tools, especially by the larger manufacturers, is increasing as the value of the motor drive is becoming more fully recognized, but some tool builders do not seem to realize this fact, or to take it into account in their designs. Machine tools so designed that the only possible way to apply motor drive is by ceiling mounting and belting down to them, or by placing the motors on the floor some distance from the tools, are very unsatisfactory, and it is safe to assume that this type would not be considered if it were possible to find other machine tools to do the work which were better arranged for motor drive.

While this fault can be found with some machine tools of recent design, most of them, however, have been on the market for years, and in place of making them more suitable for motor application some builders have designed new lines of machines which are satisfactory as far as motor application is concerned, but which cost considerably more to instal on account of the greater number of parts or attachments and higher power features. These new types of machines have a broad field of usefulness and are profitable on certain classes of work, but they do not entirely replace the old type; it is obvious, therefore, that users whose policy it is to motor drive must either drive some of their equipment with belts, or else do work on expensive tools which could be done as economically on cheaper and simpler tools.

Co-operation of User and Tool Builder.

To show what may be accomplished by a combined effort on the part of the machine tool builder and user an instance may be given of a small hand milling machine which has been arranged for adjustable speed motor drive in a very satisfactory manner by widening the column of the standard machine to receive the motor, and driving direct to the spindle by means of a sprocket chain. Ventilation is secured through suitable openings in the column. A semi-dust-proof condition is obtained by covering these openings with a fine mesh wire screen. Saving in operating time and changes in speed are obtained by the use of a starting and speed adjusting rheostat so placed on the side of the machine that the operator does not have to change his position to start, change the speeds or stop the machine. This application requires no extra floor space, and it makes a self-contained portable unit which can be readily shifted from one location to another, making the tool available and desirable to those wishing motor application.

In making the change the tool builder was put to some additional expense, and the purchaser was charged accordingly for the first machines, but, on later purchases, the price was about the same as the regular charge for the standard cone type. This is very uncommon, however, as machines sold for motor drive generally cost more, regardless of the fact that the full value of the parts not required seems more than those added for motor application.

Speed Changing Features.

A few years ago it was not considered advantageous to motor drive planers, but now the adjustable speed reversing motor drive for planers is generally accepted as a decided improvement over the usual method of belt drive. This is merely mentioned to call attention to the possibility of eliminating some of the mechanical speed changing features of other equally important machine tools by the use of the adjustable speed motor, and in so doing, of obtaining a more satisfactory range of speeds. On some types of machines, the speed-changing features can be omitted without altering the designs to any great extent, but this is not true in all cases, clearly showing that adjustable speed drive was not considered when designing them.

In conclusion, it may be said that on commercial lines of work, the operations and methods are so planned that the operators are only required to perform a single operation, and can, therefore, be graded accordingly. It is not good policy consequently to use highly improved machine tools capable of doing a wider range of work than the operators are called upon to do, but the machines should be equipped with any automatic features which will decrease the skill necessary to operate them, or which will reduce the cost of performing the required operations.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

MAKING A PULLEY WITHOUT A PATTERN.

THERE are various kinds of pulleys and there are many ways and means of making them. It is generally a question of selecting the best of the rigging at hand. I am not speaking of course, of shops where they form part of the regular output, but of the ordinary jobbing shop where occasional orders come in.

One of our boiler shop pulleys broke recently, and it became necessary to make a new one, as soon as possible. The old man came along in a great hurry and said he wanted it right away. "I don't care how you make it," said he. "You can put in any kind of hubs, arms or ribs; only, have it 11 ins. dia., and 22 ins. face, and bore out for a 2 3-16 ins. shaft.

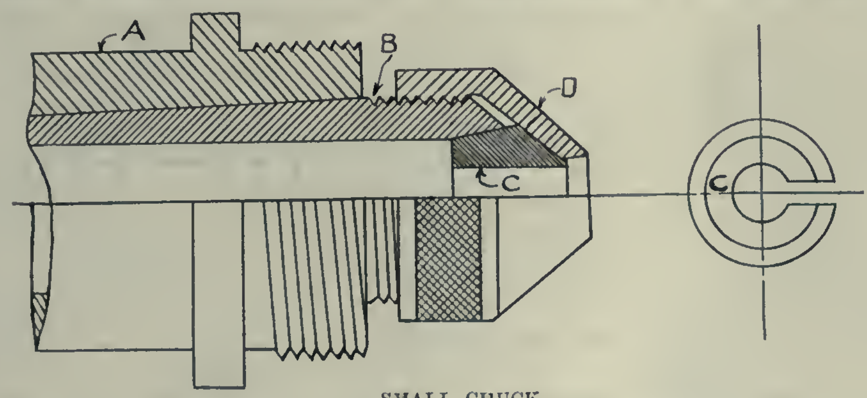
I took a scout round the pattern storage and found a piston ring 11½ in. diameter outside, 10 in. dia. inside, and 6 in. deep; an old face plate from a lathe about 15 in. dia., and a hub off another pattern 5 in. dia. and 5 in. deep, with an 1¾ in. print. The patternmaker bored a hole in the face plate to take the pin in the hub, then nailed four blocks on to keep the ring central, also 4 shallow 2 in. prints to take distance or thickness cores on the webs. I used this rig first as a core box and made 4 cores, two with the hubs and prints for distance cores, and two plain ones, these latter were struck out to a thickness of 4¾ in. so that when the whole core was assembled it would make a total length of 23 in. While these were drying, I laid down a drag, struck it off level, laid on the piston ring pattern, rammed up the outside, and kept on drawing it until I had 23 in. depth.

When the cores were dry I lowered the first one containing the hub into position with a piece of twine, slung barrel fashion, put in the 1¾ in. centre core—the 4 distance cores having been pasted in at the core bench, then lowered on the two plain cores which had already been pasted together, with the vents all leading to the print for the next 1¾ in. centre core. This latter, which had a large vent hole through it, was next put in, and the top hub core lowered into place. This last core had runner, riser and vent hole through the top to carry off the gas from the cores underneath.

The core being flush with the top of the mold I covered the rim with pieces of paper, put in the runner and riser pins, laid an 8 in. bushing on the core, put on a shallow frame and rammed it up. I then laid a flat strap across the top, slipped in wedges between strap and bushing and clamped the whole thing together and poured the job.—J. C. T.

Small Chuck.

A very handy tool for an engine lathe is the small chuck here illustrated. (A) is the lathe spindle, (B) the hollow spindle of the chuck, (C) the split ring, which must have an angle of 40 degs. at front and 10 degs. behind, and (D) the knurled locking nut.—W. Womersley.



SMALL CHUCK.

Small Lathe Dog.

The sketch, Fig. 1, shows a dog well adapted for small and short lathe work. The advantage in having the tail bent, as shown, lies in the fact that the usual shaped tail does not allow the carriage to be brought up as close as is very often required on small work. A ¼ inch 24 thread headless set screw is provided to fasten the work.

Lubricating a Lathe Centre.

I recently had occasion to make some engine lathe dead centres. It was then

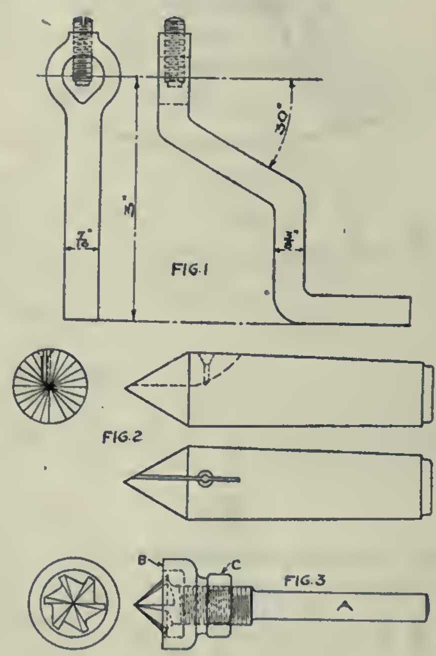


FIG. 1. SMALL LATHE DOG.
FIG. 2. LUBRICATING A LATHE CENTRE.
FIG. 3. A GAUGING COUNTERSINK.

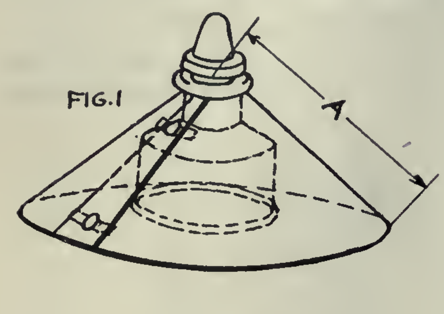
that I conceived the idea for lubricating them without drawing from the work. This was accomplished in the following manner:—After turning the blanks, I cut a 1-32 inch wide saw slot, 1-16 inch off centre, as shown in Fig. 2. A recess was then formed for catching the drops of oil by countersinking. After hardening and grinding, it was deemed advisable to remove the sharp edges on the saw slot, this being easily done with a fine oil stone. A few drops of oil squirted into the countersink recess served to keep the centre and work well lubricated for a considerable length of time.

A Gauging Countersink.

For countersinking large numbers of holes to a uniform depth the tool shown in the sketch, Fig. 3, suits the purpose admirably. It comprises the following parts. The countersink (A) is shown with a portion of the shank threaded to receive the stop (B), which is prevented from shifting its position by means of the lock nut (C). All parts with the exception of the lock nut are hardened. It hardly seems necessary to go into further details.—Chas. Hattenberger.

Ink Bottle Support.

The sketch, Fig. 1, illustrates a very simple and useful attachment for an ink bottle to prevent it being upset. It is made of strong cardboard cut in a circular shape, with radius (A) equal to three



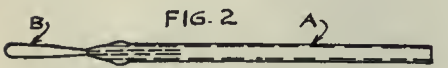


FIG. 1. INK BOTTLE SUPPORT.
FIG. 2. SAFE AND HANDY INSTRUMENT.

or four inches, and fitted about the bottle neck. The joint is secured by small paper fasteners, so that the bottle may be replaced.—W. A. P.

Safe and Handy Instrument.

Most machinists know how difficult it is to extract a splinter of wood or steel from the nervous eye of a workmate, also that the sooner it is extracted the better. The instrument, Fig. 2, not only makes the operation practically painless, but eliminates the serious danger of injuring the eye. It consists of a small brass or copper tube (A), which is flattened on an inserted very fine steel wire (B) bent in a loop. Thus, the wire loop forms a smooth end, by which loose particles may be removed from the eye. A coarse hair from the padding of a coat serves as a good substitute in case of emergency.—W. A. P.

Accident Prevention in Railroad Shops.

The matter of the prevention of accidents in roundhouses and railroad shops has received considerable attention from railroad authorities. It is recognized that while the training of the human element is as important in shops as elsewhere, yet at the same time physical conditions also merit consideration. There are four main sources of accidents in shops:—First, unguarded machinery; second, insufficient light; third, flying particles, and fourth, obstruction of passageways. These things can be properly attended to and increased safety can be obtained. Safety devices can be installed for the safeguarding of machinery; sufficient light can be provided and windows and electric lamps can be kept clean; the employees can be equipped with goggles to prevent injury of the eyes by flying particles; and passageways can in a majority of cases be kept clear of obstructions. The matter of oversight also enters largely into the prevention of accidents. If the foreman or superintendent in charge of the shop is thoroughly impressed with the necessity of accident prevention, he will find numerous ways of preventing injuries that might otherwise occur. The following are some of the precautions which employees in shops and roundhouses should observe:

Don't wear loose, baggy clothing in working around moving machinery.

Don't walk on railroad tracks, and before crossing any track "Stop, Look, Listen."

Report all unsafe conditions and practices to the foreman or other person in charge.

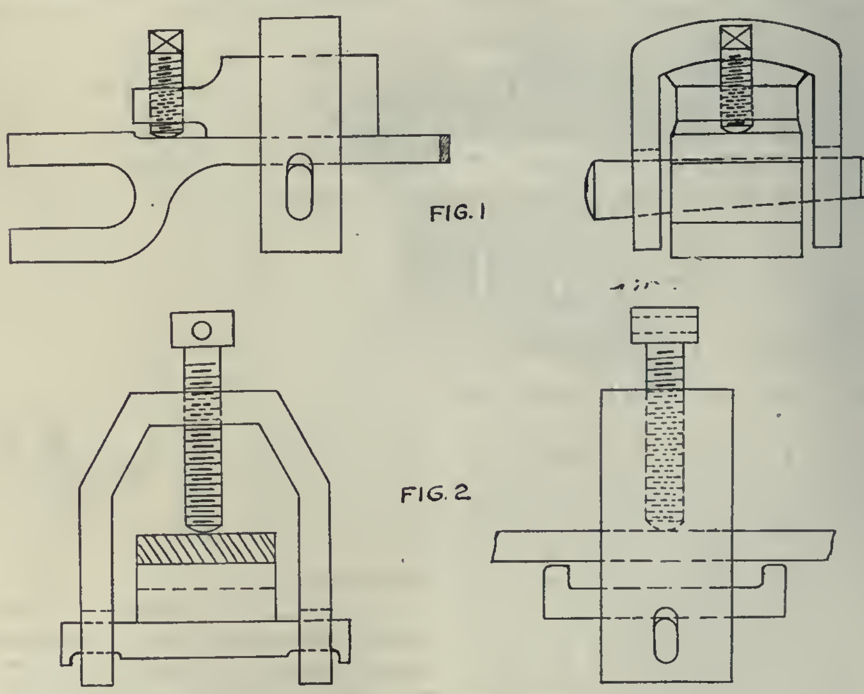
Explain fully to your helper the proper methods of work. A little time spent by a mechanic in imparting instructions to his helper may save one or both an injury.

Never jump on moving cars or engines. This is a risk which no shopman is required to take and which he cannot afford to take.

Bending Kinks.

I introduced these kinks into a crane-making shop. Previously all levers and rods were bent in the vise with cumbersome bending irons and levers. A great amount of time was wasted in taking down the job and walking to the vise. Fig. 1 shows a device for bending eccentric rods, levers, etc., without taking down the members. It is only necessary to slip the strap over the bar, adjust it, and drive the key into place. The screw can then be turned with an ordinary wrench. The key can be backed off slightly, and the strap slipped along the lever, if more than one operation is needed to properly bend or straighten it. With this arrangement it is possible to make short bends and work in restricted places.

Another arrangement is shown in Fig. 2. This is easily adjusted for bending in either direction, it being only necessary to reverse the block. The key is detachable. A particular point of merit lies in the fact that it can be used without disconnecting the eccentric rod, and in case of emergency it can be used as a blade twister by placing a piece of iron under one edge of the block.—W. Womersley.



BENDING KINKS.

P. A. Peterson, for many years chief engineer of the C.P.R., died November 21, after an illness extending over ten years, Mr. Peterson was born at Niagara Falls seventy-four years ago, and received his education at University of Toronto, where he graduated with the degree of B.Sc. He was president of the American Society of Civil Engineers at one time, and was also one of the few Canadian members of the British Association. He built a large part of the Intercolonial Railway, and was connected with the construction of a part of the Canadian Pacific. He retired ten years ago from the position of chief engineer of the C.P.R.

GENERAL INDUSTRIAL GOSSIP

A Review of Developments in the Industrial World which Make for Higher Degree Achievement along Economic Lines Through Concentration and Conservation of Effort

MACHINE TOOLS FOR ELECTRICAL MACHINERY PRODUCTION.

"A. E. G. Journal."

SOME 20 years ago, an electrical machine with an output of 1,000 h.p. was regarded as a curiosity. The construction of large machinery had then made very little progress, and it was impossible to conceive that in a short time the manufacturing of electrically driven rolling mills, winding machines, large gas engine dynamos, water turbines and other similar machines would furnish an almost unlimited amount of work for the electrical engineering industry.

When the A. E. G. built its large machine shops in the Brunnenstrasse during the year 1896, with their 14 bays, and installed a 20-ton crane for transporting the large machine parts, which was 8 metres in height, and had a span of 14 metres, these works were looked upon as the most modern of their kind. It was impossible to foresee at that period that at the end of a very short time this building would no longer meet requirements. Nevertheless, even two years ago it became necessary for the A. E.G. to decide upon the erection of a special building for the manufacture of very large machines.

Building and Equipment Features.

This building, which is of great height, is constructed with a steel framework on the triple-jointed arched girder principle. The main stays and girders are filled out, which imparts a very attractive appearance to the structure. The roof is constructed almost exclusively of glass, so that all parts of the building are flooded with light. The hall is 140 metres in length at the present time, and is to be extended later to 200 metres. The effective crane height is about 15 metres and the span 30 metres.

The new hall is therefore double the height and double the width of the old building. It contains 3 crane runways one above the other. On the main runway there are two 75-ton cranes. Below them are bracket cranes having a lifting capacity of 5 tons, for transporting light material. Finally, motor-driven jibs with a lifting capacity of 2 tons are mounted on the main columns. Even the largest and heaviest parts of machines for reversing rolls, large water turbine and gas-engine plants can be transported from place to place with ease in this enormous building. The exceptional dimensions of the hall were essential, as machines with outputs of 10,000 kw. and parts weighing 100 tons are handled daily at the present time.

No difficulty is experienced in handling even the largest parts. The framework of the large machines projected above the crane runway in the old shops, and had, therefore, to be dismounted for transport, whereas the entire machines can now be lifted and turned in one piece.

Tools Brought to the Work.

The new shops are equipped with the most modern machinery. As the transportation and fixing or centreing of the large castings always entails a great loss of time and expense, the opposite method of procedure is now adopted; the work itself is moved as little as possible, the tools being brought to it. This system also possesses the advantage that it is possible to work with a number of machine tools simultaneously.

For example, while holes are being drilled on the exterior of a stator by two or three machines, a slotting machine may be working at the same time on the inside, producing the slots. When these operations have been concluded, the work passes on to the next process —namely, that of turning. For this purpose the heaviest, strongest and largest lathes constructed at the present time are available in these machine shops. They permit even the largest stators and rotors to be placed on the faceplate and turned in one piece.

"Shavings" is scarcely the correct term for the waste material here; the iron is literally torn off in blocks by the turning tools. On lathes of this kind, a rotor which formerly took 3½ weeks to turn, can now be completed in three days.

Mechanical Coil Winding.

In order to avoid the frequent insulating and lacquering work necessary when winding by hand, which occupies a great deal of time, large machines for voltages of 6,000 volts and more are now provided exclusively with coils manufactured mechanically. The winding machine winds the coils layer by layer with scrupulous accuracy. All interstices between the windings which might lead to the generation of ozone or oxidation of the wires—that is, to the destruction of the insulation, are obviated by impregnating the coils at a high pressure.

Testing the Product.

After the poles have been turned and mounted, the rotors of the water turbine generators are placed in a speed testing pit armoured with gravel and concrete, and are tested to an excess speed of 80 per cent., thereby ensuring absolute immunity against explosion when the machine is erected on site. These water turbines run normally at a speed which is perfectly constant. A certain amount of foreign matter which is unavoidable at high water, such as stones, bits of wood, etc., gets fixed in the regulators, notwithstanding the use of screens and gratings. The turbine and generator will then get out of control if the load is taken off suddenly. The excess speed test is carried out with a view to this possibility. By these means any faults in the material are discovered in the factory and therefore no injury can be caused to persons or property by the rotor flying to pieces after the machine has been installed.

All machines are manufactured with the assistance of modern arrangements, each part is carefully checked, and finally each machine, including the largest, is tested at full load on the test bed, after which the finished machine can be taken to its destination.

WORKMEN'S COMPENSATION IN ONTARIO.

AFTER over three years' study of the question of workmen's compensation, which matter was placed in his hands by the Provincial Government on June 30, 1910, Sir William Meredith has presented to the Lieut-Governor-in-Council, an exhaustive report, in which he makes recommendations, furnishes reasons for them, also arguments for their adoption by the Legislature.

Features of the Report.

A Government Board will administer the law.

So long as disability lasts, compensation goes on.

Railway companies do not contribute to the accident fund.

Contributory negligence no bar to compensation.

Ontario Government will make contribution to compensation fund.

Compensation for managers, no matter how highly paid, is limited to $2,000 a year.

Board will have final decision as to disposition of reserve fund.

New Act is founded on the German law, and is said to be the best in the world.

Under the new Act, workmen are defended against unscrupulous employers.

An injured man may be granted compensation without litigation.

Board's decision is final, but Crown may state a case for opinion from Appellate Court.

Accidents and industrial diseases are on the same footing.

Employers must share expense of administration.

Crown is not included in Act, but will call on board in case of accident to Government employes.

In the case of "wilful or serious misconduct" no compensation will be paid unless death or serious disability results.

Common law, in so far as it allows an employe to take upon himself risks in connection with his employment, is declared unfair and is abrogated.

Navigation and telephone companies must commute weekly or periodical payments to their employes, and keep their workmen insured against accidents.

The Act does not, at present, include in its scope wholesale and retail establishments, domestic servants or farms, but the board is empowered to bring them in when it sees fit.

Under new law, workman suffers loss of wages for 7 days, if disability does not last longer; outlay for medical treatment; loss of 45 per cent. of wages while disability lasts; employer is called on to pay 55 per cent. of injured party's wages while off duty.

Reciprocity in Boiler Inspection.

To avoid any possibility of their boilers being penalized in the way of pressure allowed, the firm of Baldrig, Yerborough & Hutchinson, of London, Eng., who have secured the contract for Section No. 2 of the Welland Canal, have offered to pay the traveling expenses of a Government inspector to England and back, so that any boilers found under standard may be replaced. It is not likely that the Ontario Government will do this, as the boiler inspection staff have plenty of work to do at home. The provincial boiler inspection regulations only came into force on July 1, so that there are scores of boilers in Ontario, waiting to be inspected. It is work that requires doing immediately, as three recent serious boiler explosions prove. Up and down the province there must be a large number of boilers which have passed their useful stage, and are not fitted to stand the steam pressure being used. The boiler in the Manley Chew sawmill at Midland, Ont., which exploded last month and killed two men, was one of them.

It is very hard to see the necessity of sending a Government inspector to England to inspect boilers so that the contractors may save the expense of sending inadequate ones out. It is safe to say that if they pass the test of the British Government they will pass muster in Ontario. It would be a dangerous precedent too. Another firm might want to send a Government inspector to Siberia, which would be just as reasonable. Some day there may be reciprocity between the Mother Country and the Dominions in this matter, when a boiler which can be operated at 95 lbs. pressure in Great Britain will be permitted to do the same in Canada. Something along that line is being planned now in Canada. Mr. D. M. Medcalf, chief boiler inspector of Ontario, has been instructed by his Minister to communicate with the Departments in other provinces to have their representatives meet in Toronto in January, to discuss the question of interprovincial reciprocity in boiler inspection.

Moving Pictures of Steel Plants.

A moving picture is being shown in Canada just now, illustrating the manufacture of steel. Patrons of the "movies" are taken through the various departments from the furnace to the rolling mills. Incidentally all this is used as the basis for a tragedy. It is not likely that any more steel will be used as a result of this picture, yet this is the medium chosen by German iron and steel manufacturers for pushing trade in foreign countries. An organization has been formed, and special efforts are to be made in China and the Far East, so as to overcome the hold of Great Britain and United States. Films illustrating the achievements of German industry in most graphic style are to be shown in connection with lectures in the native tongue of each particular district. These are certainly novel lines on which to push the steel industry, but no one dare predict for what purpose the moving picture will be used next.

Must Use Smoke Consumers.

Montreal, like most large manufacturing cities, is troubled with smoke from factories. Mr. O. E. Champagne, city boiler inspector, following a suggestion made by the grand jury, has recommended that a by-law be passed which will make it compulsory for householders as well as factories to use anthracite coal and smoke consumers, instead of soft coal. There is a city by-law already which makes it compulsory for factories and works of all kinds to use smoke consumers, and attention is now being turned to residences and apartment houses. The Board of Control have referred the matter to the legislative committee.

Farewell to a Machine Shop.

Some may think there could be no romance in a machine shop. To the man who has worked in one building for over thirty years, its dirty walls and worn-out benches become almost sacred, and to leave them is like leaving the old home. There are many such shops in this country—shops that sent out the machines that served Canada years ago, but which in the twentieth century are inadequate and sooner or later must give way to the forward march.

The boiler and machine shop of the A. R. Williams Co., Toronto, has been serving a useful purpose for over half a century. It is situated near the waterfront, and must be demolished to make way for the new Union Station. The occasion could not be allowed to pass without some ceremony, so the two oldest employees, Merti Shea and Stephen Crute, who have been employed in this shop over thirty years, were given the honor of driving rivets in the last boiler made there. As this took place, the wrecking crew of the Grand Trunk Railway stood around, ready to begin the demolition of the building. Among the officials of the A. R. Williams Co. present were: A. R. Williams, T. A. Hollinrake, and F. W. Kischel. Fifty years ago, these shops were occupied by Dickie & Neil, makers of boilers and machinery, and were known as the Soho Machine & Boiler Works. Thirty years ago they were taken over by the A. R. Williams Co., who have recently built a new and up-to-date establishment in Lake Street.

Tests on Rope Drives.

A paper read in the United States describes tests on rope drives under widely varying conditions. Efficiency is highest at the lower speeds, and decreases most rapidly at speeds greater than 4,500 feet per minute. Span between centres has little effect on efficiency until spans greater than 150 feet are used. The American system of driving gives higher capacity and efficiency than the English system when conditions are suitable for its adoption. If care be taken in erection and in jointing of ropes there is no reason why multiple-rope driving should not be as efficient as single-rope driving. The results are plotted in curves, and show for the American open drive an efficiency of 93 per cent. within a wide range; for the English open drive the efficiency decreases linearly from 91 per cent. to 85 per cent. as the speed increases from 2,300 feet per minute to 5,600 feet per minute. The English open drive appears, according to the paper, to be unsuitable for spans of more than 100 ft. because the upper slack part sinks down and may rub on the ground.

DEVELOPMENTS IN MACHINERY

A Record of New and Improved Machinery Tending Towards Higher Quality and Economical Production in the Machine Shop, Blacksmith Shop or Planing Mill.

RADIAL DRILL FOR BRIDGE WORK.

BRIDGE and structural engineers particularly have been interested in the new bridge across the St. Lawrence above Quebec, and in the shop specially designed and erected at Lachine, near Montreal, for building this huge piece of work in Canada. The equipment throughout has been special and suitable to the conditions demanded by the size of the parts and the material used. Our illustration shows one of a lot of 40 radial drills supplied by the Canada Machinery Corporation, Ltd., Galt, Ont., to the St. Lawrence Bridge Co. These machines were specially designed for the work, and contain many features of note.

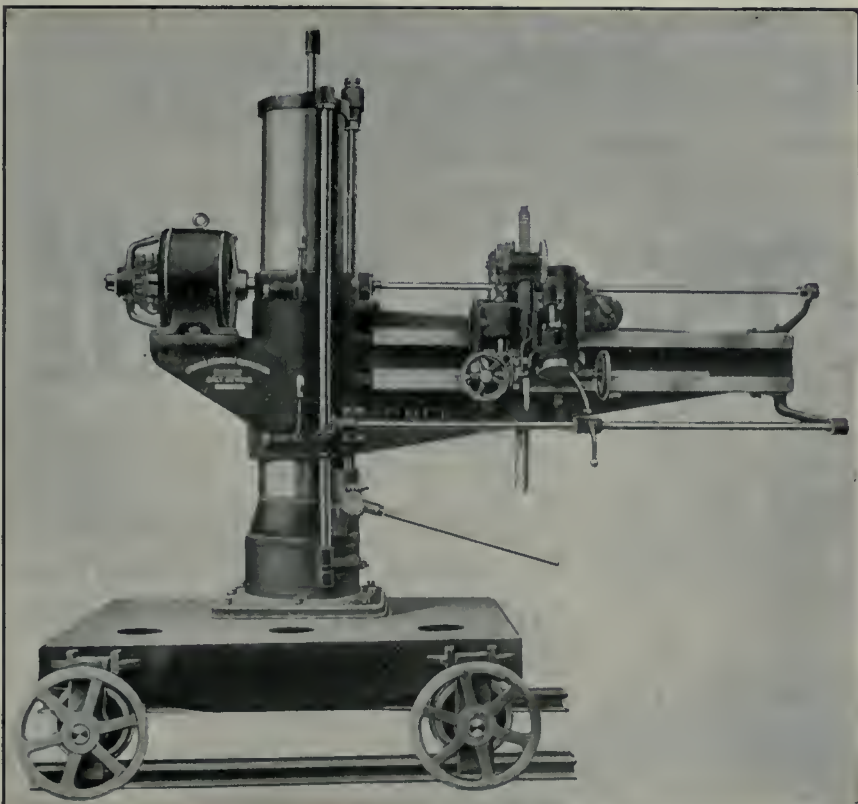
The drill is of the radial type with a 76 in. arm and round column. Sixteen of the drills were arranged for mounting on a floor plate and the remaining 24 were provided with trucks as shown on the illustration; these trucks having wheels to run on a standard gauge track, to be moved along as the work requires. Arrangements have been made for clamping the truck rigidly to the rails, and a prominent feature of the design is the ease with which the truck may be unclamped, moved to a new position and quickly clamped in place again.

The drills have been provided with a direct connected motor mounted on the arm, and driving the drill spindle through spiral gears and an intermediate shaft. This gives an exceedingly direct and strong drive and one possessing several good features.

The bearings with the exception of the guide bearings of the spindle itself, are all of the full ball bearing type, and the spiral gears are made from high carbon steel and bronze, totally enclosed with a large grease cup for lubrication. The motor is of the variable speed type with a range of speed sufficient for the work required, so that no change gears have been provided in the drive.

The feed is of the all-geared type with four changes, and is also provided with a quick return and slow hand motion. The controller handle of the motor travels with a carriage, enabling the operator to start and stop or change the speed without leaving the carriage. The locking of the arm is done by means of the handle travelling with the carriage, this being a great convenience when working at the end of a long arm, as the operator does not need to leave the carriage for each adjustment.

The machine under test has drilled 1 3-16 in. holes from solid high carbon steel at the rate of 10 in. per minute, and owing to the ball bearing equipment, a very high proportion of the horse power from the motor is delivered to the spindle.



RADIAL DRILL FOR BRIDGE WORK.

30-IN. RAPID REDUCTION LATHE.

THE description and illustrations refer to a new machine recently developed at the Pond plant of the Niles-Bement-Pond Co., for the heaviest kind of roughing work, such as is required in steel and forge shops. It is of massive, powerful construction, steel gears being used throughout. Some idea of the strength and power of this machine may be gained from the fact that it is provided with a 35-H.P. motor, which will deliver to the tool about 26,000 lbs. pressure at 50 feet per minute. With 19 ft. bed, the net weight of this machine, including motor, is 25,600 lbs.

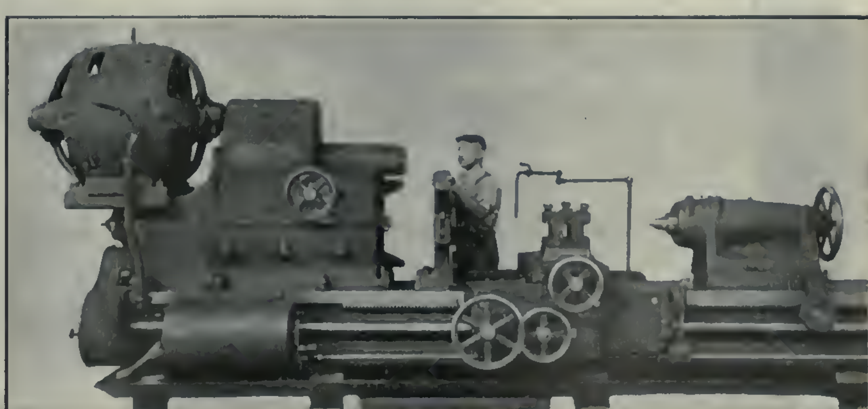


FIG. 1. FRONT VIEW OF POND RAPID REDUCTION LATHE.

For the First Time in a Quarter of a Century Comes a Marked Improvement in the Making of Twist Drills

Wilt Twist Drills are made by an entirely new process:—

A process that machines the entire tool in a single chucking—thus insuring a degree of accuracy that is well nigh impossible under old-fashioned methods where five or more separate chuckings are necessary.

The material goes in one end of the automatic machine —the drill comes out of the other.

Wilt Twist Drills

Are Made In Canada

They are made of the highest grade steel that can be bought.

They are machined with absolute accuracy and uniformity.

The contour of the grooves is scientifically determined—to produce maximum cutting efficiency,

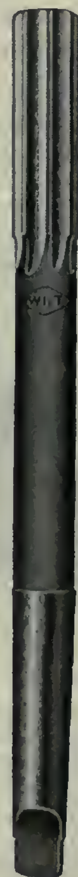
The clearance is machined to a nicety that insures maximum working capacity and freedom from binding.

Accuracy and uniformity to a degree not possible hitherto are insured by the patented automatic machine process under which Wilt Twist Drills are made.

Hence we say to you in all sincerity — "You can't afford to delay a practical trial of these remarkable drills."—

You are cordially invited to write us concerning your drill requirements.

Wilt Twist Drills and Reamers are Scientifically Hardened in an Electric Furnace



Nothing is trusted to chance or guess-work.
The heat is regulated to an exactness that is not possible in any other type of furnace.
Every drill is given the precise degree of hardness necessary for the work it is intended to do.
There is perfect uniformity here as well as in the designing and machining.

Wilt Reamers

Are made with the same exactness and under the same scientifically controlled conditions as the Twist Drills. They are probably the highest type of reamers ever produced — the most efficient — the most uniform in quality and grade.

Service and Quality are our watchwords. To this end we have been manufacturing a large stock of drills since August, which we will put on sale January 1st, 1914.

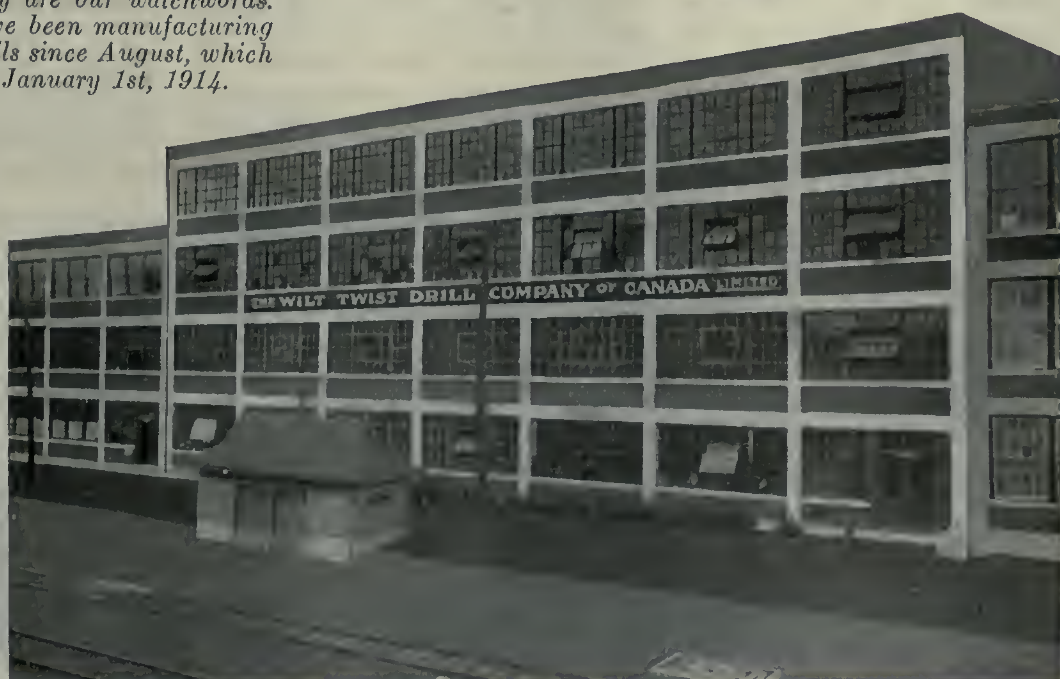
After January first, 1914, you should be able to get Wilt Twist Drills and Reamers from any jobber or dealer in Canada. If you are not supplied promptly write direct to the manufacturer.

Let us send you the Catalog.

The Wilt Twist Drill Company of Canada, Limited

Walkerville, Ontario

A. D. Wilt, Jr., President
J. Harrington Walker, Vice-President
H. A. Springle, Sec'y & Treas.
F. C. Thrall, Manager



The spindle is driven through suitable gearing by a direct connected variable speed motor mounted on the head stock. The motor pinion and gear which it drives have herringbone teeth, insuring quiet operation. Two mechanical changes of speed can be made in the headstock by convenient lever. The lower speeds of the face plate are obtained by means of a pinion driving the face plate gear. The design is such as to eliminate any tendency of the resistance of the tool or of the power applied to the pinion to lift the main spindle in its bearing. The bearing caps are relieved of the upward thrust due to the cut. The higher speeds are obtained by driving direct through the face plate spindle, thus obviating the necessity of running the face plate pinion at an excessively high speed. The end thrust on the main spindle is taken by large hardened steel and bronze washers. The gearing in the headstock in connection with the variable speed motor gives 40 face plate speeds from 13 to 174 r.p.m. By means of a handle on the carriage, the faceplate may be started, stopped, reversed or any of the wide range of motor speeds obtained without requiring the operator to leave his position at the carriage. The face plate is of steel, and is fitted with radially adjustable drivers.

All of the rotating shafts in the headstock are mounted in bronze lined, self-oiling bearings with large oil wells. All of the bearings and gears are entirely enclosed and furnished with a continuous supply of oil from a tank in the head. This tank is kept filled by a general pump, drawing oil from a tank in the bed into which all surplus oil drains. The oil is filtered before using again.

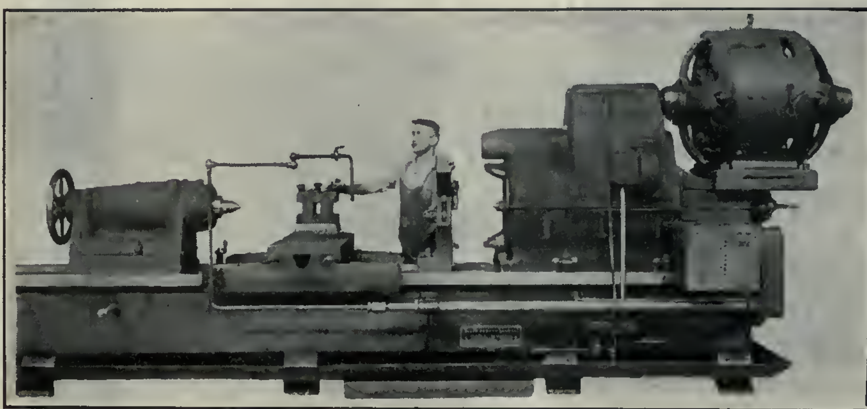


FIG. 2. REAR VIEW OF POND RAPID REDUCTION LATHE.

The tool carriage has a bearing on the bed for its entire length front and back. It is gibbed underneath the track, both inside and outside. The edges of the carriage are raised, and drains are provided to prevent the lubricant from running on the floor. The drainage surface is below the tool slide guides, all of which are protected from chips and water. The tool slide travels on a wide bridge of such length that the sliding surface on the carriage is not uncovered when turning the largest diameters. The tool block or carrier is secured to the top of the tool slide by four heavy bolts and cross key. It has two open side slots and one closed central slot, large enough to receive tools $1\frac{1}{4}$ in. x $2\frac{1}{2}$ in. Each tool slot is provided with a hardened serrated plate and three clamping screws.

A large stream of cutting lubricant is supplied by a geared pump of ample capacity, located at the head stock. Telescopic piping mounted on the back of the bed conducts the lubricant to the tool carriage from which it returns to a tank at the head end of the lathe.

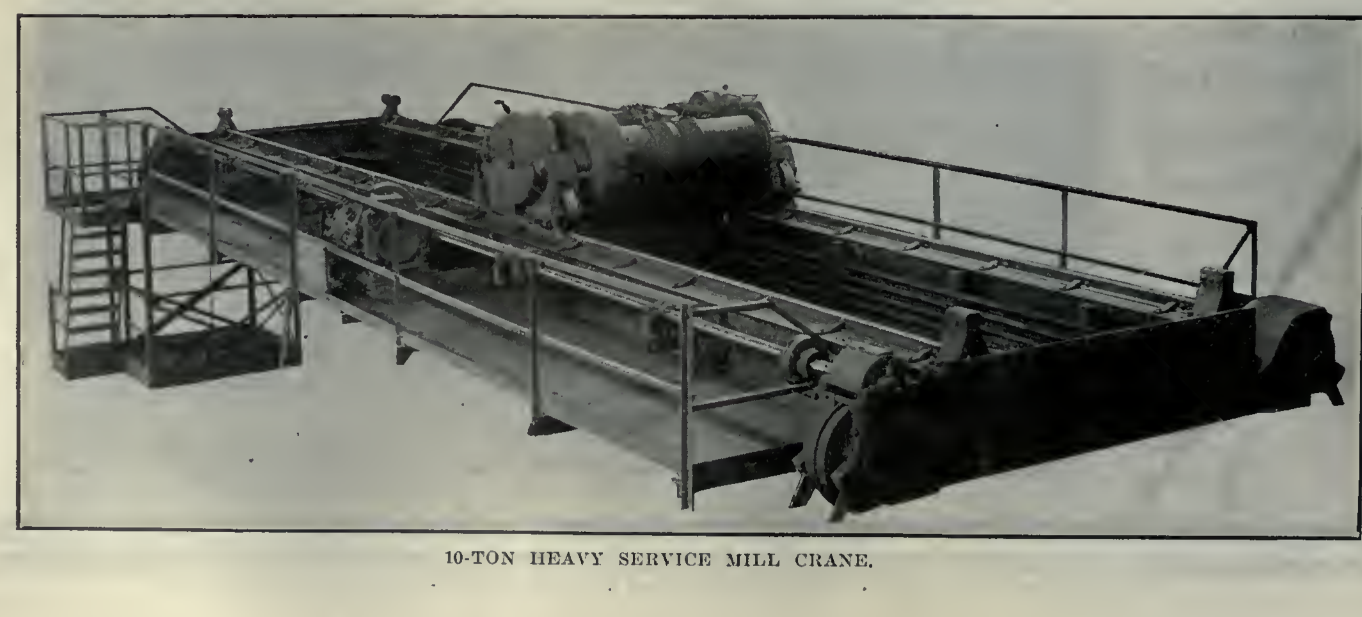
The apron is of substantial, ribbed box construction. The feed gear shafts are supported at both ends, and all rotating shafts run in bronze bushed bearings. The centre rest is of heavy, rigid construction, and is provided with three adjustable jaws with large wearing surfaces.

The tail stock is especially massive and rigid, but is readily moved by gearing engaging the steel feed rack. It is provided with a graduated setover for small tapers. The tail stock can be rigidly clamped to the bed by four large bolts, and a tail brace engages a rack in the bed, preventing the possibility of slipping under heavy loads.

The bed is very wide and deep, and has wide flat tracks tied together at short intervals by heavy box section ties. The bed is mounted on short legs in a deep steel pan which entirely surrounds the lathe, and extends beyond the sides a sufficient distance to prevent the cutting fluid dripping on the floor. The pan is also mounted on short legs, providing space underneath for a wheeled tank at the head end for collecting the lubricant.

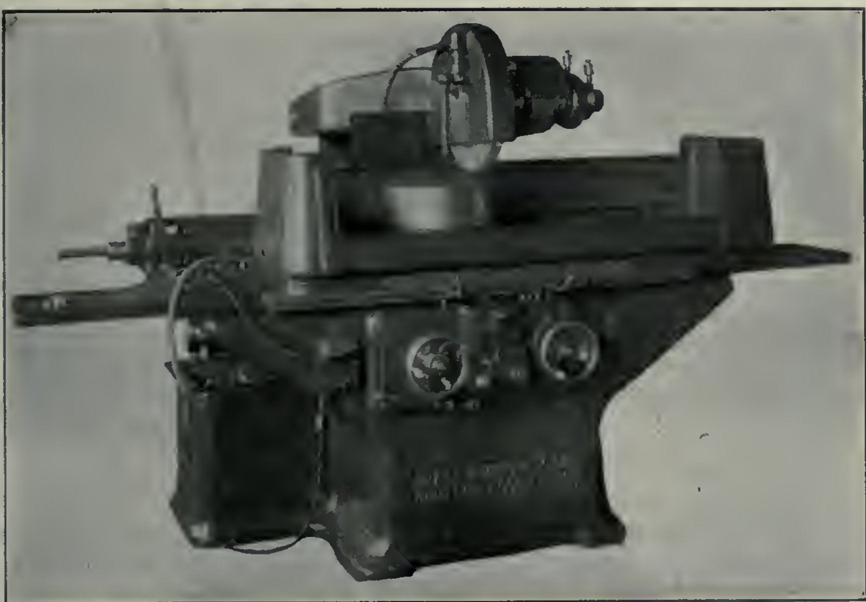
10-TON HEAVY SERVICE MILL CRANE.

THERE is illustrated and described herewith a 10-ton mill crane designed for heavy service and built by the Northern Engineering Works, Detroit, Michigan. A number of novel fea-



10-TON HEAVY SERVICE MILL CRANE.

tures are to be found embodied in this specialty. The crane is of steel construction, steel castings being largely employed. The bridge footwalks are of steel with checkered floor plates, while the bridge end trucks are M. C. B. type heavy steel castings, with safety guards in front of all wheels and safety drop lugs under the trucks.



FRONT VIEW, PRATT & WHITNEY DISK GRINDER, SHOWING CONTROL MECHANISM.

The trolley is built along the lines of "Northern" patented type (E) design, adapted to heavy mill service, and has a cast steel frame and cast steel girt. The intermediate reduction gearing is run in a gear pocket cast into the trolley side, connecting the back geared motor with the drum gear. When especially high speed designs are used, the motor back gear is used as the only intermediate gear, making a two reduction design. Mill motors are used and the bridge is equipped with bar conductors attached in the most approved manner. All wiring is in steel conduit.

Trolley wheels have guards in front of them, and all trolley bearings are of capped type with split bushings. Trolley axle bearings are all M.C.B. type, with steel waste pockets. The entire trolley has safety pan underneath. The cage is of extra large size with outside steel staircase leading to footwalk. There are no overhanging gears and no open gears on the whole crane. An extra large safety factor is used, while automatic limit stop for hook, automatic electric brakes and dynamic brake are among the other features.

The crane is built to conform to the standard safety specifications of the Electrical Mill Engineers, supplemented and modified by the special specifications of the mill of one of the large steel firms in the Pittsburgh district for which the crane was built. Several cranes of similar construction and larger capacity have since been ordered by the same interests.

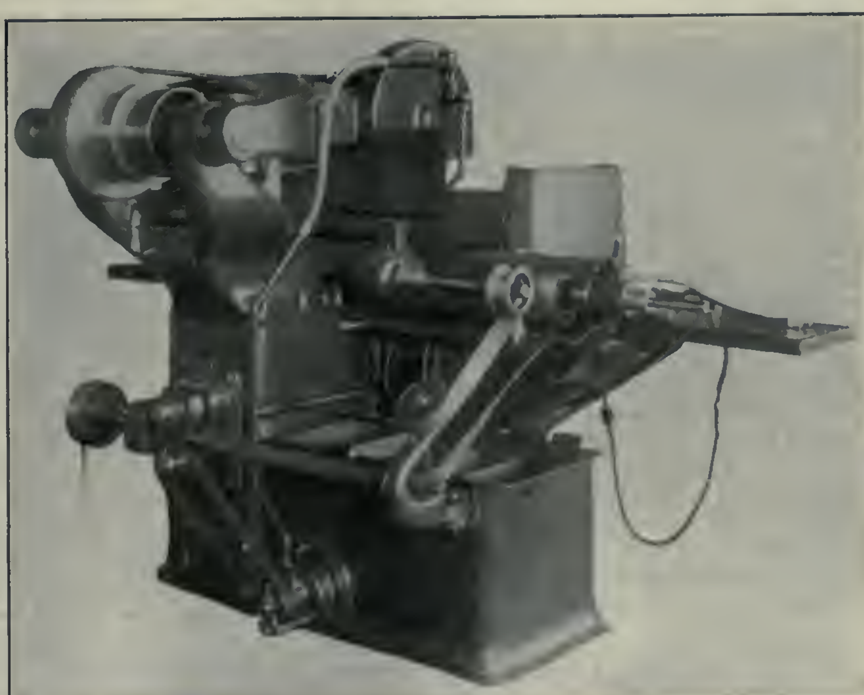
The Northern Crane Works, Walkerville, Ont., are the Canadian branch of the Northern Engineering Works, of Detroit.

PRATT & WHITNEY DISK GRINDER.

THERE are certain classes of work finished by grinding, in which it is preferable to have the finish lines circumferential, instead of having the radial lines which result from the use of a cupwheel. To meet the requirements of such work, and especially for circular grinding where the surfaces to be ground are at various heights, the Pratt & Whitney Co., Hartford, Conn., has brought out a new grinder, front and rear views of which are here illustrated. This machine has also been found very satisfactory for grinding thin hardened disks, as there is relatively little heat generated during the grinding processes, so that the work may be finished without distortion. Another application is the grinding of large piston rings and similar classes of work, the large wheel used on this machine handling such pieces without perceptible wear.

The bed, table and table feed mechanism are similar in design to the 14-inch vertical surface grinder of this Company's manufacture. The machine is adapted for using a large size wheel, which is adequately supported and powerfully driven. The wheel is mounted at right angles to the work and provision is made for delivering a liberal supply of water during the grinding operation. The bed is massively proportioned and internally braced in a manner that insures ample rigidity and permanent alignment; it is of compact design, and the various units are located in a way that makes them easily accessible. Wide bearing surfaces of the vee and flat types are provided, and oil reservoirs for automatically oiling the ways are located in the bed. The pan which surrounds the rear of the bed for collecting the water and chips is of liberal proportions and easily accessible for cleaning.

The table is of heavy construction and powerfully ribbed to prevent warping and resist torsional strains. The table is



REAR VIEW, PRATT & WHITNEY DISK GRINDER, SHOWING WHEEL SUPPORT AND ARRANGEMENT OF DRIVE.

slightly longer than the bed and the traveling action keeps the bearings perfectly true. Guards are provided at each end of the table, which cover the bearings and protect them from injury, and a pan is cast integral with the table for controlling the water. The work-holding problem is simplified by the use of a rotary magnetic chuck which forms part of the equipment of this machine.

The table is provided with an automatic reciprocating motion, the desired length of stroke being obtained by means of adjustable table dogs. The table feed mechanism is designed as a simple and compact unit, which is easily accessible. Two table feeds are provided, both of which are instantly controlled by means of a lever located at the front of the machine. When adjusted to the central station, this lever serves as a means for stopping the table; when placed in the upper position, the slow feed is engaged; and when located at the lower station, the fast feed is brought into action. The table is driven through a vertically located rack and pinion, the construction being such that the possibility of vibrations—commonly called "tooth marks"—showing in the work is eliminated.

One of the important features of this machine is mounting the wheel on an arm, which entirely eliminates the use of a slide construction. The arm is accurately fitted on an arbor, which, in turn, is supported by an upright at the rear of the machine. Both the arm and arbor are of ample proportions to insure absolute strength and rigidity. With this construction, the wheel is supported without overhang, and the control of the vertical wheel feed is also made a simple matter.

Referring to the rear view of the machine, the arrangement of this method of supporting the wheel will be readily apparent, and it will also be seen that the arm has a liberal bearing upon the arbor, the bearing surfaces being dust and water-proof. Both hand and power vertical wheel feeds are provided. The feed mechanism operates a screw, which engages the under side of the arm upon which the wheel is mounted, thus adjusting its position as desired. Both the elevating screw and nut are of liberal proportions and made easily accessible; the power feed is obtained by means of a ratchet wheel and pawl, which act in connection with the elevating screw. Provision is made for automatically disengaging the power feed, and the feed may be accurately gauged by means of a large dial, the periphery of which is graduated to thousandths of an inch. The feed operates at the end of each stroke when the wheel is entirely clear of the work.

The wheel spindle is made of tool steel, fully heat-treated, and then ground and lapped to obtain the highest possible efficiency for this important member. The bearings are bronze bushed and mounted in conical seats; being made and located in such a way that they are easily accessible for adjustment and absolutely dust and water-proof. Particular care has been taken to obtain proper lubrication, large self-feeding oilers being provided for this purpose. The wheel-mount is self-contained and constructed in a way that insures having the wheel held securely and perfectly true. The end of the spindle is made conical to receive the wheel-mount, which is positively driven by means of a key.

The machine is designed to use wheels up to 18 inches in diameter by 2 inches in width, but suitable packing rings are provided to permit the use of wheels down to a face width of 1 inch. The wheel spindle drive is of liberal proportions, so that there is no question as to whether the wheel will have power for the most severe classes of service for which the machine is intended. Two speeds are provided by means of a two-step cone pulley so that when the diameter of the wheel is reduced by wear, its speed may be proportionately increased.

It is well known that in order to keep a grinding wheel cutting freely and to prevent the work from heating, a liberal supply of water is absolutely necessary. This point has been given careful attention and the pump used is made and located in such a way that it entirely dispenses with the use of the customary type of idler pulleys. The pump is capable of delivering an abundant supply of water, which is drawn from a tank located at the back of the machine, where it is readily accessible for cleaning. The water is returned to the tank without being carried through pipes. The pipe through which the water is conveyed to the wheel is attached to the guard and may be quickly adjusted or removed according to the requirements of different classes of work. Both the table and wheel are provided with guards to prevent water from being thrown onto the floor.

To Overcome Factory Fatigue.

More and more attention is being paid to the welfare of the workman, not only from a humanitarian point of view, but from the standpoint of dollars and cents. In Germany, various engineering works have found that it pays to provide rest rooms for employees, so that older and experienced men especially may retire at convenient periods, and return to their work better fitted. Everybody knows that a man's efficiency drops to a low level after working continuously for five hours. Several firms in Ontario, who have given this matter thought, have adopted various schemes for overcoming fatigue. In Guelph, we believe, hot coffee and rolls are delivered from a central depot to the various plants in that city at a very cheap rate. Frank B. Galbraith, who has made a scientific study of fatigue of workers in stores and factories, speaking before the Engineering Society of the School of Science, Toronto, on November 13, stated that if a workman could only sit down for five minutes every half hour, the gain would be inestimable. Failing this, he should be taught to rest his weight on one foot, and then on the other. There was no reason, he said, why a man should stand all day if he could perform the same work sitting down. Mr. Galbraith told of a factory where, owing to the revolving of shafts, the floor had a continuous vibration. The fatigue suffered by 300 girls employed on that floor was 100 per cent. eliminated by putting springs on the legs of their chairs. He did not advocate the elimination of fatigue altogether; in fact, he would have men be so tired when they got home they would require their dinner brought to them; but this fatigue should be caused by accomplishment, and not by waste of energy. Mr. Galbraith's idea of teaching a man to carry his weight on one foot sounds amusing at first thought. There are some machinists so intent on their work they could not be induced to sit down. On the other hand, there are clever mechanics who are equally industrious, yet not half as strong, who would benefit by a rest at certain periods. The street railway companies realize this, and supply seats for motormen who have non-stop runs. Dr. Hastings, the medical health officer for Toronto, will inaugurate a system next year for the medical inspection of factories. Its chief features will be: Regulation of temperatures in work rooms, conveniences for scrupulous personal cleanliness, and a plentiful supply of pure drinking water.

Pigeon, Pigeon & Davis, Patent Solicitors, St. James Street, Montreal, report that 133 Canadian patents were issued for the week ending November 4th. 1913, 84 of which were granted to Americans, 21 to Canadians, 19 to residents of Great Britain and Colonies, and 9 to residents of foreign countries. Of the Canadians who received patents, 8 were residents of Ontario, 5 of Quebec, 3 of Manitoba, 3 of British Columbia, 1 of New Brunswick, and 1 of Prince Edward Island. In the United States for the same week, 719 patents were issued, 9 of which were granted to Canadian inventors.

TRADE AND COMMERCE RECORD

Dealing With the Steps Being Taken and Progress Made by Industrial Canada To Achieve and Maintain a Dominant Place in the Markets of the World.

British Market for Canadian Cars.— A new departure in the Canadian car industry is likely to result from the visit to England of Hon. Nathaniel Curry, President of the Canadian Car and Foundry Co. by which Canadian cars may be shipped to Great Britain to compete against the home product. Up to the present time, a market has been provided in Canada for the entire output of the Canadian Car & Foundry Co., but with the completion of the new plant of the company at Fort William, and the increased production at the old plants, a market abroad is now being sought, to take care of any surplus that may result. It was pointed out by an official of the company a few days ago, that with the completion of the Fort William plant, the Western business would be pretty well looked after, and that this would leave the company free, and with ample time in the east to look after the foreign business. While on the face of it, the export of railway cars to Great Britain looks like a pretty big problem, it was pointed out that cars could be shipped "knocked down" to very good advantage. Flat cars would be shipped intact. Box cars and stock cars would be shipped "knocked down," and passenger cars would be first put together here, and then marked and taken apart, so as to be put together on the other side with but slight cost. It is felt by the officials of the Canadian Car and Foundry Co. that the Canadian concern would receive the preference in the British Colonies on this business, and a strong bid is to be made for it during the next few months. Cars could be shipped direct by steamer from the Amherst N.S. plant, as well as from Montreal.

The Evil of Bonusing.

It will be interesting to watch the effect of a new law being introduced into Saskatchewan, to prohibit the bonusing of industries. Hitherto it has been customary all over Canada for a town to attract new factories by what is virtually a bribe. This takes various forms; sometimes it is the loan of a large sum, or an exemption from taxes, or a free site, and sometimes the bribe includes all of these. Often the effect has been to place a lame concern on the backs of the ratepayers. Then, such a policy had a disturbing effect on manufacturers. A town would make an offer to a firm in an adjacent town to move their plant, promising them a bonus in return. A case of this kind is reported from Levis, Que. The city of Sherbrooke is alleged to have offered a firm of boot and shoe manufacturers in the above town certain concessions if they would move their plant to Sherbrooke. As the concern in question is one of the main supports to Levis, considerable bitterness has resulted. Another effect of the bonusing system is to be seen in the action of old established concerns asking the town in which they are located for the same favors as are being given to incoming industries. An instance of this is attracting attention in a town on the Pacific coast. A large industry has threatened to move to another town if its ground rent is not reduced considerably. As the firm in question is contemplating an extension, efforts are being made to satisfy them. It must be admitted that such methods are not satisfactory, and Hon. George Langley has taken upon himself the task of amending the Town Act of Saskatchewan, so as to prohibit the granting of exemption of taxes or a free site. Nothing is said about the granting of loans and the guaranteeing of bonds. If such a law were introduced in Ontario, it would have the effect of sending industries to towns where they were best suited, and would stop this wild competition now going on between various cities.

Technical Education Delayed.

The Toronto Globe published a startling despatch from Ottawa last week to the effect that the Hon. T. W. Crothers, Minister of Labor, had authorized the statement that he had summarily stopped any further payments to Dr. James Robertson, Chairman of the Royal Commission on Technical Education, and to Thomas Bengough, secretary, and had ordered immediate completion of the Commission's recommendations for establishing a comprehensive system of technical education and industrial training throughout Canada under Federal grants. His present desire is apparently finally to wash his hands of the Commission and its report. The Globe's story is denied by Conservative newspapers, who, however, add that Hon. Mr. Crothers has been dissatisfied with the lack of expedition in completing the report. Mr. Crothers certainly has had a long while to wait to learn what is required in the way of technical education in this country. We do not believe he has any intention of shelving the subject. It is one of the most vital necessities of Canada, and if it is delayed much larger, there will be a loud outcry heard from people interested. Until some big move is made in this direction, Canada is in the rear in the matter of education. Outside of a few large cities, there are practically no facilities for the son of a workingman to secure a technical training.

Not Time to Tender.

A British firm wrote to the Hamilton Board of Control last week asking that tenders be advertised a month in advance of the letting of contracts, as the short time now given did not permit of British firms tendering. The city engineer advised the Board that changes had frequently to be made in plans, and it was often impossible to advertise for tenders a month ahead. He suggested that firms in other countries who did not have a representative in Canada should do without the business, as it was found more desirable to treat directly than by letter. Eastern manufacturers in Canada often have cause to make the same complaint against Western municipalities, who give two weeks at most in which to tender for supplies. A case in point occurred recently. Victoria, B.C., advertised tenders for a large amount of steel pipe and for a telephone line in connection with the Sooke waterworks. The contracts are important ones, but tenders had to be in by November 24, whereas they were only called for two weeks ago.

Quebec Bridge on Barges.

The Quebec Bridge will shortly reach the stage attained several years ago when it collapsed and killed scores of employees. Plans have been prepared by the St. Lawrence Bridge Co., Ltd., for erecting the main span, measuring 1,800 feet in length. This will be divided into three sections, two of which will be built out from the north and south main piers, measuring 580 feet each in length, while the centre piece, measuring 640 feet, and weighing 6,000 tons, will be built on five floating barges, and floated from the Levis side of the river to a place where it can be drawn into position. These barges will be built ready to be used next season. The sub-structure of the bridge, which has been in the hands of M. P. and J. T. Davis, is now completed.

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A weekly newspaper devoted to machinery and manufacturing interests, mechanical and electrical trades, the foundry, technical progress, construction and improvement.

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Vol. X. NOVEMBER 27, 1913 No. 22

PRINCIPAL CONTENTS.

QUEBEC ARSENAL SCANDAL.

A DEPLORABLE state of affairs has been found to exist at the Quebec Arsenal. Last summer an investigation was held, presided over by Col. Sir H. W. W. Barlow. As a result of developments, the superintendent, Colonel Gaudet, has been retired, and Major Lafferty put in his place. It has been found that whereas ammunition was supposed to be made to Woolwich standard gauges, not a single Woolwich gauge was to be found in the institution. An effort was made to salvage six or seven million .303 bullets and brass cases ready for loading, but without success. All must be scrapped. Another twelve million rounds were condemned by the Barlow Commission, and ordered scrapped. It was found that 1,500,000 cartridge case cups were not up to standard, and had to be melted down. In this case, the first operation in the manufacture of the cups had been performed wrongly because the machinery did not run true. Over 160,000 steel clips of simple design, were found to be useless, not having been made according to specification.

Another unpleasant development was found in the shell factory. This department was organized three years ago, and has never yet produced a shell correct to dimensions. The machinery for turning out these projectiles is found to be in such poor condition that it will take a long while to put it into shape again. Of the 8,000 shells in stock, the Barlow Commission recommended that such as were nearly correct to dimensions should be tested and salvaged if possible. On examination, not a single shell could be found that was properly shaped. The monetary loss in this department alone will probably exceed $100,000. It was also discovered that no stock-taking had taken place in the arsenal for thirteen years, and a discrepancy of $15,000 between the quantities shown in the stores account of the general ledger was found. No proper bookkeeping system was introduced until 1900.

If Canada is unable to make shells, she will find it difficult to make warships. It is a ten to one bet that the conditions above related do not exist at the Ross Rifle factory, also in Quebec. No concern could exist for a month with such rottenness. It is another case of politics interfering with industry. Evidently the Quebec arsenal was started badly, and has been badly managed since. If the Government cannot make shells profitably and accurately, they should hand the business over to a private concern who can. In view of the fact that much of the machinery in the Arsenal was found out of order, it would be interesting to know how many expert machinists are employed there, whether they have had any experience at this class of work, and how many employees in the Arsenal secured their jobs through politics.

ACCIDENT PREVENTION.

THE conservation of human life, whether from the "snuffing-out" or health-maintenance point of view is a movement which has developed and progressed rapidly, and, to-day we find it in the very forefront of every domestic, social, municipal and political propaganda. While the necessity for practical and effective effort in the direction indicated has all along existed, it seems strange that a realization of the enormous waste, of the untold suffering and of the consequent wretchedness should have been so long in actively expressing itself.

That, the awakening to existent conditions is largely attributable to the inception of the efficiency movement, there is not the shadow of doubt, yet the scope and purpose of accident prevention and conservation-of-life-effort is both infinitely greater and higher in ideal than its birth source. Men are being given a new outlook in life, and are being made to feel their individual importance. It is true that we can each be done without when the "call" comes, but it is equally true that until then we have a place to fill, and that it is up to each of us to fill it, not carelessly or indifferently, but alertly and diligently.

THE Board of Directors of the Canadian National Exhibition, Toronto, have decided to build a new Machinery Hall, with direct railway facilities for handling heavy machinery. A new site will be secured, and the old Machinery Hall used for other purposes. Plans are being prepared by Geo. W. Gouinlock, Temple Building, Toronto.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

	Mont'l.	Tor'to.
Grey Forge, Pittsburg.	.....	$14 25
Lake Superior, charcoal, Chicago	.....	15 25
Middlesboro, No. 3....	20 00	21 50
Carron, special	24 25	.....
Carron, soft	24.25	.....
Cleveland, No. 3.......	20 00	22 00
Clarence, No. 3........	20 50	21 00
Jarrow	.....	23 50
Glengarnock	......	26 00
Michigan charcoal iron.	25 00	.....
Ferro Nickel pig iron (Soo)	.....	25 00
Victoria, No. 1........	19 40	18 35
Victoria, No. 2X	19 15	18 10
Victoria No. 2 Plain ..	18 90	17 85

BILLETS.

	Per Gross Ton.
Bessemer billets, Pittsburgh ...	$21 00
Open hearth billets, Pittsburgh.	21 00
Forging billets, Pittsburgh.....	26 00
Wire rods, Pittsburgh	26 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto..	2.00
Steel bars, f.o.b., Toronto........	2.05
Common bar iron, f.o.b., Montreal.	2.10
Steel bars, f.o.b., Montreal.......	2.15
Bessemer rails, heavy, at mill.....	1.25
Steel bars, Pittsburgh	1.30
Tank plates, Pittsburgh	1.25
Beams, Pittsburgh	1.30
Angles, Pittsburgh	1.30
Steel hoops, Pittsburgh..........	1.50
F.O.B., Toronto Warehouse.	**Cents.**
Steel bars	2.25
Small shapes	2.35
Warehouse, Freight and Duty to Pay.	**Cents..**
Steel bars	1.80
Structural shapes	1.90
Plates	1.90

Freight, Pittsburgh to Toronto.

18 cents carload; 21 cents less carload.

IRON PIPE FITTINGS.

Canadian malleable, 40 per cent.; cast iron, 65; standard bushings, 70; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 77½; malleable, lipped unions, 65.

NAIL AND SPIKES.

Standard steel wire nails, base..	$2 30	
Cut nails	$2 60	2 65
Miscellaneous wire nails...	75 per cent.	
Pressed spikes, ⅝ diam., 100 lbs.	2 85	

BOILER PLATES.

	Mont'l.	Tor'to.
Plates, ½ in., 100 lbs.....	$2 35	$2 30
Plates, ¼ in., 100 lbs.....	.....	2 20
Heads, per 100 lbs.	2 65	2 55
Tank plates, 3-16 in.......	2 60	2 30
Tubes, per 100 ft., 1 inch	9 50	8 50
" " 1¼ in.	9 50	8 50
" " 1½ "	9 50	9 00
" " 1¾ "	9 50	9 00
" " 2 "	8 75	8 75
" " 2½ "	11 15	11 50
" " 3 "	12 10	12 50
" " 3½ "	14 15	14 50
" " 4 "	18 00	18 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Stove bolts	80 & 7½
Machine bolts, ⅜ and less	65 & 10
Machine bolts, 7-16......	60
Blank bolts	60
Bolt ends	60
Machine screws, iron, brass	35 p.c.
Nuts, square, all sizes....	4¼ per lb off
Nuts, Hexagon, all sizes..	4½ per lb off
Fillister head	25 per cent.
Iron rivets	60, 10 p.c. off
Wood screws, flathead, bright	85, 10, 7½, 10 p.c. off
Wood screws, flathead, Brass	75, 10, 7½, 10 p.c. off
Wood screws, flathead, bronze	70, 10, 7½, 10 p.c. off

Milled Products.

Sq. & Hex. Head Cap Screws	65 & 10%
Sq. & Hex. Head Cap Screws	65 & 10%
Rd. & Fil. Head Cap Screws	45-10-10%
Flat & But. Head Cap Screws	40-10-10%
Finished Nuts up to 1 in...	75%
Finished Nuts over 1 in....	72%
Semi-Fin. Nuts up to 1 in..	72%
Semi-Fin. Nuts over 1 in...	72%
Studs.....................	65%

Discounts, f.o.b., Montreal.

OLD MATERIAL.

Dealers' Buying Prices.	Mont'l.	Tor'to.
Copper, light	$10.50	$10 50
Copper, crucible	14 00	12 50
Copper, uncr'bled, heavy	13 00	11 50
Copper wire, uncre'bled	12 50	11 25
No. 1 machine compos'n	11 00	10 75
No. 1 comps'n turnings.	9 50	9 00
No. 1 wrought iron	10 00	8 00
Heavy melting steel....	8 50	8 50
No. 1 machinery cast iron	13 00	12 50
New brass clippings....	8 50	8 75
No. 1 brass turnings....	7 25	7 50
Heavy lead	3 75	4 00
Tea lead	3 00	3 00
Scrap zinc	3 00	3 50

WROUGHT IRON PIPE.

The following are Toronto jobbers' discounts on pipe in effect from April 21, 1913:

	Buttweld		Lapweld	
Standard	Black	Gal.	Black	Gal.
¼, ⅜ in.	64	49	....	....
½ in	68	58	....	....
¾ to 1½	73	63	....	....
2 in.	73	63	69	59
2½ to 3 in.	73	63	72	62
3½ to 4 in. ..	71½	61½	70½	60½
4½ to 6 in. ..	....	....	71½	61½
7, 8, 10 in. ..	....	....	66	54
X Strong P. E.				
¼, ⅜ in	56½	46½	....	....
½ in.	64	54	....	....
¾ to 1½ in. ..	68	58	....	....
2 to 3 in.	69	59	....	....
2½ to 4 in. ...	....	....	66	56
4½ to 6 in. ..	....	....	64	56
7 to 8 in.	....	....	55	45
XX Strong P. E.				
½ to 2 in.	43	33	....	....
2½ to 4 in. ..	....	....	43	33

PRICES OF WROUGHT IRON PIPE.

Standard.		Extra Strong,		D. Ex. Strong,	
Nom. Diam.	Price. per ft.	Sizes Ins.	Price per ft.	Size Ins.	Price per ft.
⅛in	$ .05½	⅛in	$ .12	½	$. 32
¼in	.06	¼in	.07½	¾	.35
⅜in	.06	⅜in	.07½	1	.37
½in	.08½	½in	.11	1¼	.52½
¾in	.11½	¾in	.15	1½	.65
1 in	.17½	1 in	.22	2	.91
1¼in	.23½	1½in	.30	2½	1.37
1½in	.27½	1½in	.36½	3	1.86
2 in	.37	2 in	.50½	3½	2.30
2½in	.58½	2½in	.77	4	2.76
3 in	.76½	3 in	1.03	4½	3.26
3½in	.92	3½in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4½in	1.27	4½in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.86	...	.....
7 in	2.38	7 in	3.81	...	.....
8 in	2.50	8 in	4.34	...	.....
8 in	2.88	9 in	4.90	...	.....
9 in	3.45	10 in	5.48	...	.....
10 in	3.20	....	....	...	.....
10 in	3.50	....	.....	.....	.....
10 in	4.12	....	....	...	.....

METALS.

	Mont'l.	Tor'to.
Lake copper, carload....	$16 00	$14 75
Electrolytic copper	15 25	14 75
Casting copper	15 10	14 25
Spelter	5 35	5 25
Tin	41 00	40 00
Lead	5 40	4 85
Antimony	8 50	8 75
Aluminum	21 00	16 00

SHEETS.

	Mont'l.	Tor'to.
Sheets, black, No. 28	$2.85	$2.90
Canada plates, ordinary, 52 sheets	2.90	3.00
Canada plates, all bright	4.00	4.15
Apollo brand, 10¾ oz. (American)	4.30	4.20
Queen's Head, 28 B.W.G.	4.40	4.40
Fleur-de-Lis, 28 B.W.G.	4.20	4.25
Gorbal's Best, No. 28	4.40	4.40
Viking metal, No. 28	4.40	4.40

MISCELLANEOUS.

	Cents
Putty, 100 lb. drums	$2.50
Red dry lead, 5 cwt. casks, per cwt.	6.00
Glue, French medal, per lb.	0.10
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.26
Benzine, per gal.	23½
Pure turpentine	0.60
Linseed oil, raw	0.60
Linseed oil, boiled	0.63
Plaster of Paris, per bbl.	2.10
Plumbers' Oakum, per 100 lbs.	3.25
Pure Manila rope	0.17

COKE AND COAL.

Solvay Foundry Coke	$5.95
Connellsville Foundry Coke	5.80
Yough, Steam Lump Coal	3.88
Penn. Steam Lump Coal	3.68
Best Slack	2.99

All net ton f.o.b. Toronto.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents.

Montreal, Nov. 24, 1913.—Trade conditions still rule on the dull side, though the machinery business is perhaps a trifle brisker than it was last week. The announcement contained in a Canadian Associated Press cable to-day that only 52 per cent. of the $3,500,000 six per cent. five-year note issue of the Dominion Steel Corporation in London had been subscribed by the public did not create a great deal of surprise, although there was some expectation that, as the underwriting went so well, the public issue would meet with better success. The failure of the public to take more kindly to the issue makes no direct financial difference to the Steel Corporation, but Mr. Plummer would no doubt have welcomed a stronger testimonial of confidence. It is recognized, however, that industrials cannot expect to do as well as the higher grade municipal offerings in a market like the present, and that the Steel outcome was about as good as could have been expected. It is understood that Mr. Plummer is on his way home.

The season of navigation being now practically at an end, the prices for Scotch and English pig iron have been materially advanced this week. Of course, consumers have laid in their winter supplies by now, and present quotations are merely nominal, there being very little business done in these brands during the winter. Canadian and United States pig iron remains very dull, with no present prospect of improvement.

The steel situation remains unchanged. Conditions in Canada are rather better than in the United States, and that is the best that can be said. Although common bar iron is still being quoted at $2.10 f.o.b. Montreal, this price can be cut to $2.05 for large lots.

The copper situation is peculiar. Prices are still falling, and the producers seem to have failed so far in their efforts to establish a market, buyers apparently considering the price still too high. Tin remains unchanged, but lead is a little easier this week owing principally to the smelters at Trail, B.C., having resumed deliveries.

Toronto, Ont., Nov. 25, 1913.—The cuts in the prices of steel which were expected have not taken place. The only remarkable fall this week is that in the price of scrap and metals. Most scrap iron and scrap steel is $1.25 and $1.50 cheaper this week than last. Local business from warehouse for finished steel is standing well generally, although the mill business is not good. Deliveries range from four weeks to three months. Cutting of prices by outside steel concerns, who only enter this market when business is depressed, has ceased. It seems they have come to their senses, and are now doing their utmost first to get inquiries.

Prices of finished steel from the mills remain unchanged. The warehouse prices quoted in Canadian Machinery this week for steel bars and shapes are low, and are for big business only. Steel bars are being sold in smaller quantities at better prices. Mill prices for steel bars, f.o.b. Toronto, have been quoted at $2.10 for some time. As in many cases only $1.90 is being secured, our quotation has been reduced to $2.05. This seems to be an average price for steel bars in Toronto.

Motor Business Poor.

Jobbers and structural men are not buying finished steel and iron just now, owing to the proximity of Christmas stocktaking. With most of these firms stocktaking is a big contract, and means that a good part of the staff have to be laid off temporarily. Manufacturers who feel the depression the most just now are the stove people and automobile firms. The latter are not buying, and it is said that only one firm of automobile makers has bought steel in the last six months.

The shipbuilding and boiler concerns in Toronto are kept fairly busy with Government orders, which have been rather plentiful of late. The Polson Iron Works and the John Inglis Co. both received nice contracts last week. The Collingwood Shipbuilding Co. are also busy.

There is little demand for wire, but the nail business is fairly good. The reduction last week in the price of wood screws did not result in better business. The Swansea branch of the Steel Company of Canada is now working six days a week.

Boiler Plate Cheaper.

Boiler makers and other manufacturers will be interested to know that a reduction has taken place in the price of boiler heads and plates. Quarter-inch plates, which were $2.30, are now $2.20. The quotations for tubes are correct, though these are being shaded slightly when business warrants.

Machine Tools.

There is considerable movement just now in the market for contractors' machinery and supplies owing to the contracts having been awarded for the Welland Ship Canal. The Dominion Dredging Co. have already let their contract for equipment. Inquiries have been coming in during the past week from the Canadian Dredging Co. for prices on machinery. They must have been pretty sure of getting the contract for Section No. 5. This was awarded to them yesterday. Their contract price is about $2,000,000. Only one more section remains to be put under contract.

The number of machine tools disposed of by agents is small. Quite a number of firms are equipping, but are either not buying just now, or are purchasing only second-hand tools. The Canadian Fairbanks-Morse Co. sold a 25-ton gantry crane this week to the T., H. & B. Railway for their unloading yards at Hamilton.

Metals.

The most remarkable upheaval last week took place in the metal market. Prices came falling down in all lines, but the result is not an improvement in business. There is neither buying nor selling. Readers should compare this week's prices with those of last week to realize how prices in old material and metals have changed.

Lake copper, which was $15.25, is now $14.75. These prices are, of course, for carload lots. Tin, which was $41.50, is now $40.00. All scrap copper is down a dollar per cwt. The only scrap metals holding up at all were new brass clippings and No. 1 brass turnings. The drop has been taking place all week, and there is every indication that prices will drop further.

St. John, N.B., Nov. 22, 1913.—The fall business in the industrial section of the Maritime Provinces may be said to be most encouraging. Orders on new goods are heavy, and many plants are running extra time to complete shipments. In Halifax and St. John much interest is now being evinced with regard to the opening of the winter port season, which always means increased orders in stocks and repairs to the various machine plants, foundries, etc., and this year the belief is that with the increased sailings and the larger amount of trade looked for, the machinery firms will reap considerably more benefit than heretofore. A great deal of construction work, which has been in progress for some time around the harbor front in each city is now being rushed to completion—that is, what was scheduled to be finished in time for the winter port season of 1913-1914. Thousands of dollars have been expended, and are being spent still in this connection at both Halifax and St. John.

Although many have wondered at the rapidity with which the work on the new sugar refinery of the Atlantic Sugar Refineries, Ltd., has been going on in St. John, the contractors say they have not been doing as well as might be the case were they not held up for steel supplies. Structural steel deliveries have been slow, and owing to the lack of material, it was necessary to lay off some of the employees for a time.

The execution of the lease between the Ford Motor Co. of Canada and Hon. Wm. Pugsley for the acquisition of the new factory buildings of the Maritime Motor Co. at Coldbrook was completed this week. On or about December 1 the Ford people are expected to take up their location at Coldbrook. The new buildings which they will occupy are up-to-date in every detail, having been constructed of concrete and brick at a cost of upwards of $70,000.

An amalgamation has taken place with regard to the St. Croix Soap Manufacturing Co. of St. Stephen, N.B., and their extensive plant at that place, in that they have joined forces with the Associated Industries of England. The company is being taken in at a valuation of two million dollars. There is a possibility that the refining process may be carried on at St. Stephen, not only for the St. Croix plant, but for the other Canadian plants which have become factors in the amalgamation also.

Application has been made at Fredericton for the organization of the Atlantic Oilfields, Ltd., in which Albert Gregory, of Fredericton, is interested, with Captain von der Osten, a Berlin capitalist, as promoter. The company has acquired the rights from the Government of forty square miles of area in the vicinity of Sussex, N.B., and will develop this territory not only for salt, but for oil shale and gypsum as well, valuable deposits of which exist in the neighborhood. The new company is capitalized at $3,000,000, of which $1,000,000 is to be in 6 per cent. preferred and the remainder common stock. The promoters are cherishing the hope that potassium may also be found in the district, and, if so, potassium works will be established.

Frasers, Limited, are to have another new saw mill on the St. John River, and Swan Creek, near the northern line of Sunbury and Queen's Counties, has been selected as a site. The Company have acquired the rights to a large tract of land on which they will build their plant.

The Imperial Packing Co. of Woodstock, N.B., has been reorganized, with a larger plant and increased capital. The firm's production has been greatly augmented. E. R. Teed has been elected president, and Alfred Page, manager and secretary. The financial backing is strong.

The Smith Lumber Co. has built a new mill near by the plant of the Imperial Packing Co., and has a most up-to-date plant, while Major J. J. Bull, President of the Maritime Cooperage Co., in the same vicinity, says that their plant is to be materially improved.

It is said in Chatham, N.B., that the iron mines in Gloucester County will be operated as usual, and will not be closed because the Canada Iron Corporation is in liquidation. It is understood that Captain G. E. Corbett, of Annapolis, N.S., and A. J. Stewart, M.P.P., of Chatham, have had a conference with the Provincial Government, and that the former will continue the operation of the mines, taking out about 150,000 tons of ore each year.

The Dominion Coal Co. has agreed to give its miners increased pay. Since September last negotiations have been in progress regarding wages between the Company and the Provincial Workmen's Association. A new agreement to extend for at least three years has been entered into, whereby about 6 per cent. increase will be given.

ACCIDENT PREVENTION IN TEXTILE MILLS.

THE superintending inspector of factories for the Leeds, England, district has presented an agreement between representatives of employers, employees and inspectors concerning the fencing of machinery and the prevention of accidents in woollen and worsted mills. The report sets out in detail the points of agreement, and they include the following general provisions:

1.—On new machinery all projecting setscrews on continuously revolving parts shall either be countersunk or be otherwise efficiently protected; where projecting setscrews are placed inside box pulleys they shall be deemed to be efficiently protected. Projecting setscrews on existing machinery to be fenced unless safe by position.

2.—Ladders, other than stepladders, shall be fitted with hooks or other non-skid device; provided that in mule spinning rooms, or in rooms where persons work with bare feet, ladders shall not be fitted at the bottom with spikes.

3.—Heavy overhead main driving belts shall be guarded underneath in all cases where there is liability of persons having to pass under them.

4.—Fencing for all toothed wheels shall, as far as practicable, completely surround the wheel, so that there is no danger of any accident between the wheel and the guard itself.

5.—All representatives present were of opinion that it was most desirable that women and girls working amongst machinery should have their hair put up, or otherwise confined in a net.

6.—All firms are to be urged to keep a supply of sterilized dressings, which shall be kept available for first aid for any operative who receives a cut or wound.

7.—Cleaning machinery in motion was considered by all to be a dangerous practice, and should be avoided.

8.—Floors of machine rooms and stairs to be kept clean and free from grease as far as practicable.

9.—Periodical examination of machinery. Some person in each mill to be told off to examine, at least once a month, fencing of machinery and mill gearing, maintenance of proper temperature and ventilation, compliance with special rules and regulations, means of escape in case of fire, fire extinguishing appliances, and condition of the sanitary conveniences.

10.—Lifting of heavy weights. Children and young persons should not be required to lift weights which exceed for: Girls under 13 years, 16 pounds; between 13 and 14, 20 pounds; between 14 and 16, 35 pounds; boys under 13, 24 pounds; between 13 and 14, 30 pounds; between 14 and 15, 40 pounds; between 15 and 16, 50 pounds.—U. S. Consular and Trade Reports.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Engineering

Berlin, Ont.—H. Nyberg will build an auto factory measuring 250x250.. Plans have been prepared.

Windsor, Ont.—The Ontario Steel Products Co. have purchased 3 acres of land, and will shortly erect a modern factory.

Chatham, Ont.—The Chatham Bridge Co. have built a new plant, and will be buying new equipment.

Walkerville, Ont.—Eastern Die Works, branch of a Detroit concern, have built and are equipping a factory for manufacturing dies.

Windsor, Ont.—The Detroit Steel Products Co. have purchased a site, and will erect a plant next to that of the Vincent Steel Process Co.

Sarnia, Ont.—The Sarnia Bridge Co. are understood to be making extensions, and are in the market for a considerable quantity of machine tools.

Deseronto, Ont.—The Standard Iron Company will spend $50,000 in improving and enlarging its plant if given certain concessions by the ratepayers.

Brantford, Ont.—The Adams Wagon Co. and the Brantford Carriage Co., both part of the Cockshutt Plow Co., have made extensions to their plant this year.

Hamilton, Ont.—Shapker, Anderson & Co., Chicago, have placed $1,000,000 worth of bonds on the market to finance the Hamilton By-Product Coke Oven Co.

Brantford, Ont.—The Hartley Foundry Co., Canal Rd., have recently built and equipped a 65x40 ft. addition to their foundry. They do local jobbing work principally.

New Glasgow, N.S.—The Maritime Bridge Co. have contracts for seven large bridges in New Brunswick, to be completed this fall, and orders for over 25 bridges in Nova Scotia.

Hamilton, Ont.—The Chadwick Brass Co. asked permission to build a switch across Birch Avenue to its factory, but this was refused. The company threatened to move but this made no difference.

Brantford, Ont.—The Waterous Engine Works Co. contemplate the extension of their machine shop lengthways and sideways. This will not likely take place until the money market improves.

Prince Rupert, B.C.—The Iron Mines, Ltd., has been organized here to work some hematite deposits near Hubert, B.C. John B. Rittenhouse, New York, has just completed an examination of the deposits.

Walkerville, Ont.—The Diamond Manufacturing Co. have leased two floors in the Power Building, and are equipping it with modern machinery for the manufacture of automobile wind shields, and radiator parts.

Prince Albert, Sask.—The ratepayers have granted 10 acres of land to the Royal Farm Machinery Co., Brockton, Mass., who will build a plant here, and employ 40 men. Work on the buildings has commenced.

Belleville, Ont.—The nine-inch mill at the plant of the Steel Co. of Canada, has made a record, turning out 91,015 pounds of light horseshoes in a day. This is said to be the biggest output made on a single turn in Canada.

Brantford, Ont.—Ker & Goodwin have built an extension to their shops, which will be used exclusively for making chucks, which is their specialty. The rest of the plant is for jobbing work. They will shortly be purchasing machine tools.

Windsor, Ont.—The Windsor Power Building Co. have purchased a site and will build in the spring a modern reinforced concrete building for the accommodation of small manufacturers. E. J. Post and W. J. Smales are behind the project.

Brantford, Ont.—The Pratt & Letchworth Co., makers of malleable iron castings, expect shortly to build a machine shop, for which they have purchased shaper, wet tool grinder and lathe. Among other equipment required are a milling machine and a drill press.

Brantford, Ont.—The Massey-Harris Co. is giving some of its work to the Verity Plow Co. to allow itself room for other work. The two concerns are closely related financially. All harrows will in future be made by the Verity Plow Co., and extensions will be made to the latter plant probably next spring, and new equipment including punches, shears, drills, bulldozers, etc., will be required.

Brantford, Ont.—Keeton Motors, Ltd., who have been making a six-cylinder car up to the present, will extend their equipment to produce a small model four-cylinder car, so as to turn out 750 cars between now and next June. Their new equipment will consist of machine tools, special tools and jigs. They are now adding a trimming and painting department. This is a branch of the Keeton Motor Co., Detroit.

Montreal, Que.—It is understood that the W. W. Butler Co., Ltd., incorporated at Ottawa recently to manufacture and sell railway apparatus, have taken over the business of the Canadian Gold Car Heating & Lighting Co., Ltd., 346 St. James St., Montreal, of which F. A. Purdy is manager. Preparations are being made for the manufacture of railway supplies here which were formerly made in the States.

Vancouver, B.C.—There seems to be something in the report that Yarrow & Co., shipbuilders, Glasgow, will erect a plant here. A. F. Yarrow, head of the firm arrived last week. Frank Yarrow and Messrs R. D. Keay and E. W. Izard have been here two weeks, and have made daily visits to the waterways, armed with blue prints and cameras, apparently collecting data to lay before their board of directors.

Woodstock, Ont.—The town will loan $20,000 for the consolidation of the enterprises of Isaac L. Mitchell, who has plants in Toronto, New Hamburg, and Woodstock, for the manufacture of cement machinery, and for the enlargement of the works here. The company will add probably about 35 men to the present average staff of 38 men here, and Mr. Mitchell will take stock in the company, transferring his patterns and patents.

Welland, Ont.—Foundations for the main building of the Electric Steel Co. are now being put in and erection will be proceeded with at once. The contract will go to the Standard Steel Construction Co., Welland. Only the main building, which is to be of brick and steel, will be put up this fall but the other buildings, including the offices, will be erected early next spring. The main building, 400x82, will cost in the neighborhood of $30,000.

Quebec, Que.—R. Ernest Lefaivre, liquidator, 98 St. Peter St., Quebec, will, on December 1, sell the following assets of The Canadian General & Shoe Machinery Co., Ltd., Levis, Que., now in liquidation:—Foundry tools, coppersmith tools, boiler shop tools, carpenters' tools, drafting room equipment, stock of iron, steel, pig iron, copper, rivets, etc.; office furniture, lathes, planers, drills, electric motors, hydraulic presses, milling machines, screw cutting machines, grinders, bending and welding machinery, shapers, electric drills, turret lathes, gas engines, etc.

Electrical

Kingston, Ont.—The city is purchasing new arc lamps for the streets.

Courtright, Ont.—This town will probably give a franchise to a natural gas company.

Winnipeg, Man.—The city will install ornamental street lights on both sides of Market Ave.

Quebec, Que.—The city will borrow $450,000, of which $125,000 is being used for providing electric lights.

Montreal, Que.—The premises of F. Nicolas & Co., dealers in electrical supplies, were slightly damaged by fire on November 22.

Moosomin, Sask.—The town will probably make a contract with the Moosomin Gas Co., Ltd., to light the streets, for two years.

Victoria, B.C.—The Jordan River plant of the British Columbia Electric Co., has resumed operations, and is developing about 12,000 h.p.

Chatham, Ont.—The municipality will take steps to acquire the electric plant of the Chatham Gas Co. to be used as an auxiliary to the Hydro plant.

London, Ont.—Tenders have been called for the transformers to be used in converting hydro power into direct current for the street railway.

Toronto, Ont.—The Ontario Hydro-Electric Commission will call tenders for construction of the plant at Eugenia Falls, and for transmission lines.

Kerrisdale, B.C.—The Ratepayers' Association will ask the council to submit a by-law in January to authorize the erection of a municipal light and power plant.

St. Catharines, Ont.—Kerry & Chase, Ltd., have applied for the contract of laying out and superintending the work of the hydro municipal lighting system in St. Catharines.

Davidson, Sask.—The Canadian Gas Producer and Engine Co., Barrie, Ont., have agreed to furnish the town with an electric light plant, and take $6,500 in debentures as part payment.

Lillooet, B.C.—G. Kent, a Vancouver engineer, has been engaged by the Lillooet Light and Power Co. to do preliminary work before extending the power plant.

London, Ont.—D. Guthrie and James Collier, representing West Oxford Township, have asked for estimates on power from the Ontario Hydro-Electric Commission.

MACHINE TOOL EQUIPMENT, G. T. P. SHOPS, PRINCE RUPERT, B.C.

John H. Guess, General Purchasing Agent the Grand Trunk Railway System, Montreal, will receive tenders until December 15, for the undermentioned machine tool equipment required for the Grand Trunk Pacific Railroad Shops at Prince Rupert, B.C. All tenders must be submitted in duplicate; all tools must be of heavy construction and suitable for ship repair work, and must be provided with 550 volt, 3 phase, 60 cycle alternating current motors complete with starting apparatus. Belt driven tools will include the necessary countershafts.

1—**76-inch swing, triple geared engine lathe,** single head, length of bed to take 50 feet between centers. Belt driven.

1—**42-inch swing, triple geared engine lathe,** with compound rest and taper attachment, bed to take 30 feet between centres. Belt driven.

1—**24-inch swing, back geared engine lathe,** bed to take 10 feet between centres. Belt driven.

2—**18-inch swing, back geared engine lathes** with compound rest and taper attachment, to take 6 feet between centres. Belt driven.

1—**16-inch swing, tool room engine lathe,** 6 feet between centers, compound rest, taper attachment, relieving attachment, oil pan, drawn-in collet, 12-inch four-jaw independent chuck, 9-inch three-jaw combination chuck, ½-inch drill chuck. Belt driven.

1—**72 x 72-inch planer,** 20-foot stroke, four heads, motor-driven.

1—**24-inch stroke, heavy duty shaper,** with vise and counter-shaft, belt driven.

1—**72-inch full universal radial drill,** with speed variator and tapping attachment, box table and counter-shaft, belt-driven.

1—**30-inch upright back-geared, power feed drill,** belt-driven.

1—**26-inch upright, back-geared power feed drill.** Belt-driven.

1—**36-inch radial drill with tapping attachment.** Belt-driven.

1—**2-inch single bolt threading machine,** with taps and dies, to thread ½ to 2-inch bolts. Belt-driven.

1—**16-inch pipe cutting and threading machine** with two die heads and interchangeable chasers cutting one and 1¼ to 6-inch pipe. Belt-driven.

1—**Wet drill grinder with pointing attachment,** up to 2½ inch diameter. Belt-driven.

1—**No. 4 universal miller,** complete with usual equipment, vertical attachment, and one set sample tools Belt-driven.

1—**10-foot heavy boring and turning mill** with slotting attachment. Belt-driven.

1—**72-inch horizontal boring, turning, drilling and milling machine,** 6-inch spindle, vertical movement of saddle on column and 6-inch traverse of column on runway fitted with automatic main feed complete with outer support for boring bar; bed plate 10 x 10 feet.

Tilbury, Ont.—The town council has asked the Ontario Hydro-Electric Commission for a price on 250 h.p.

St. Thomas, Ont.—The light, heat and power department will spend a surplus of $8,000 on cluster lights. E. H. Caughell, manager.

Puslinch, Ont.—The Puslinch Council, meeting in Aberfoyle town hall, passed a motion in favor of Hydro-Electric power.

Sudbury, Ont.—A deputation from Sudbury has asked Hon. Adam Beck if the Ontario Hydro-Electric Commission will develop 35,000 h.p. for the town.

New Westminster, B.C.—The Western Canada Power Co. have been granted permission to turn Stave Lake into a mammoth reservoir for generating power.

St. Catharines, Ont. — Government engineers are engaged in surveying for the proposed big water main from Sugar Loaf to St. Catharines to supply lake water to all the towns along the canal in case the river and canal are brought to the same level.

Hamilton, Ont.—The Hydro Department will decide between the lamps of the Canadian Westinghouse Co. and the Canadian General Electric Co. They have been installed on various streets for the test.

Merrickville, Ont.—A deputation recently waited on the Minister of Railways and Canals, and asked that the dam being constructed by the Government at Merrickville be made so as to permit the development of electric power.

London, Ont.—Hon. Adam Beck last week signed a contract with the London Street Railway Co. for the supply of Hydro power for the operation of the company's system. The London lines will require at least 1,000 h.p.

Victoria, B.C.—To provide a system of street lighting for four of the wards of the Municipality of South Saanich the cost will be about $37,500, according to an estimate submitted by the B. C. Electric Co., to the regular meeting of the Council. This provides for lights on 60 thoroughfares.

Ottawa, Ont.—The Michigan Northern Power Co., in conjunction with the Algoma Steel Corporation, has applied for approval of a scheme to divert certain waters of the St. Mary River at the Soo and develop power for the various industries on both sides of the international boundary.

Brandon, Man. — C. Chamberlain, representing the Great Falls Power Co., says his company will develop Silver Falls if given the city's order for power. His terms are: 1,000 h.p., at $40 per h.p. per annum; 1,250, at $39; $1,500, at $38; 1,750, at $37; 2,000, at $36; 2,250. at $35; 2,500, at $34; and so on down to 3,500 h.p. for $30. A conference of power users will be held.

Winnipeg, Man.—The National Construction Co. have applied for a permit to erect a power house for the Provincial Government to supply power to the Parliament Buildings, Law Courts, etc. It will cost $160,000. The boiler room will contain fourteen boilers. There will also be an engine room, workroom, fan room, and pump room. A smoke consumer will be installed.

Salmon Arm, B.C.—The power house was finished last week. Tenders were called for a 150 h.p. oil engine with direct connected 100 k.w. 2,200 volt, 3 phase, 60 cycle, generator, and exciter. The tenders were to include a four panel switchboard, consisting of one combined generator and exciter panel and three feeder panels, also a 12 k.w. series street lighting panel and constant current transformer. The successful tenderer for the engine was the Edmund P. Kay Co., representing the Swedish Diesel Co., and for all the other apparatus, the Canadian Westinghouse Co.

General Industrial

Sydney, N.S.—A number of city men have bought a site for a flour mill in Sydney.

Walkerville, Ont.—A roofing company have leased the old plant of the Walkerville Malleable Iron Co.

Toronto, Ont.—The Consumers' Gas Co. has issued a call for tenders for 750,000 worth of new stock.

Merriton, Ont.—The Riordan Paper Co. are installing a new water wheel in their mill. The plant is closed down.

Newmarket, Ont.—The town is making a loan of 15,000 to a clothing company, which will erect a plant costing $40,000.

Newmarket, Ont.—The council is negotiating with some manufacturers of ladies' clothing who purpose locating here.

Windsor, Ont.—A newly organized syndicate, to be known as the Windsor Milling Co., with capital of $100,000, has purchased from Wm. Orr the Orr Bros.' flour mill here for $30,000.

Regina, Sask.—The Downing Shoe Factory will open for business on December 10. The manufacture of shoes will commence about February 1, 1914.

Oakville, Ont.—Work on the plant of the James Langmuir Co., paint manufacturers, Toronto, which is being moved here, is nearing completion.

St. John, N.B.—The Atlantic Sugar Refineries, Ltd., have spent $453,557 on their new plant, and have asked the city to remit $20,000 of their deposit.

Edmonton, Alta.—Doulton's, the English pottery and terra cotta makers, have been looking over a field of clay recently discovered. J. A. Bonn represents them.

Toronto, Ont.—Bowes & Francis, contractors in reinforced concrete, with offices at 309 Stair Building, have assigned to J. P. Langley, with liabilities of $15,000.

St. Catharines, Ont.—The Consumers' Tire & Rubber Co. will erect a plant here in the spring. The capitalization is $400,000. This is the second rubber concern secured recently.

Levis, Que.—Messrs, Begin & Freres, tile pipe manufacturers, of Windsor Mills, Que., will erect a plant here, 160x60 feet, and pay $20,000 annually in salaries if given a bonus of $13,000.

Toronto, Ont.—Soren Brothers, tinware manufacturers on King Street west, have sold the factory which they erected on Claremont Street to a whitewear manufacturing concern for $30,000.

Saskatoon, Sask.—Christie Bros., Calgary, have bought the Sanitary and Hygienic laundries, and ordered three cars of new machinery, all electrically driven. They will generate their own power.

Sherbrooke, Que.—MacKinnon, Holmes & Co. have been unable to negotiate the issue of bonds for the erection of their new plant, and have asked the city to endorse tthem. They will spend $20,000, and will employ 50 to 100 men.

Charlottetown, P.E.I.—The City Council will grant to the promoters of a concern to manufacture woollen underwear, these concessions:—Exemption from taxation for ten years, and a bonus of $600 per annum for five years.

London, Ont.—Building operations have been commenced on the addition to the plant of the Taylor & Pringle Co., Ltd., pickle and aerated water manufacturers. The addition is to be completed for the commencement of the year 1914.

St. Catharines, Ont.—The factory of the United Rubber Manufacturing and Reclaiming Co. will be established in St. Catharines. R. J. Cluff, general manager of Steel & Radiation, Ltd., is president, and G. C. Rough, sales manager of the Packard Electric Co., is a director. Building will commence in April on a plant to employ 200 men.

Esquimault, B.C.—The B. C. Pottery Co. last week took out a permit for a three-storey structure of mill construction type. The cost of the building is $20,000. The contract has been let to Carkeek & Co., and the architects are the Geysbeek Engineering Co. T. G. Sedger is consulting architect. Completion of the building is promised in about sixty days, when some eighty men will be given employment.

St. John, N.B.—German capitalists, headed by Capt. Von Der Osten, of Berlin, have secured from the province government a concession of forty square miles near Sussex, N.B., and will prospect for salt gypsum ore, potassium and petroleum. The project is capitalized at three million dollars, and in particular the promoters expect to develop a big industry in potassium, which is known to exist in large quantities, and for which the United States offers an almost unlimited market.

Caledonia, Ont.—The contract was let a few days ago for the foundation work of the plant of the Haldimand Gypsum Mines Co., situated just outside of the western limits of the village. A meeting

of the directors was held, and all plans have been completed to rush this work, so that the erection of the mill can be carried on during the winter and the whole plant be ready for spring. It is expected that about 300 horse-power of Hydro-Electric will be taken from the village, and that about 100 hands will be employed at first.

Wood-Working

Midland, Ont.—Manley Chew, whose saw mill power house was wrecked recently by an explosion, will rebuild.

Hespeler, Ont.—Part of the Canada Woolen Mills have been leased from the Stamped Enamelware, Ltd., for a furniture plant, to be operated by Mr. Gotwell, Grand Rapids, Mich. David N. Panabaker will be manager.

Wiarton, Ont.—Fire from an unknown cause destroyed the $50,000 saw mill of Charles Pedwell at Lion's Head, entailing a loss of at least $28,000, insurance being placed at $12,000. Mr. Pedwell, head of the firm, stated that the mill may not be rebuilt.

Oakville, Ont.—Davis & Doty have started to erect a sash and door factory on a site near the new paint factory.

Trenton, Ont.—As it is thought the fire which recently burned the baby carriage factory was of incendiary origin, the Town Council have ordered an investigation.

Contracts Awarded

Salmon Arm, B.C.—Mayor Scales has arranged with the Municipal Construction Co., of Vancouver to complete the water works system.

New Westminster, B.C.—James & McClughan have the contract for four 2,000-gallon water tanks for the Government snagboat being built by the Coquitlam Shipbuilding Co.

Ottawa, Ont.—Macdonell & Dibblee, Montreal, have been awarded the contract for building a temporary bridge to replace Billings' Bridge. The tender of Shuttleworth & Black was $50 higher.

Vancouver, V.C.—The contract for building a passenger subway to the North Vancouver ferry wharf has been awarded to the M. P. Cotton Co., their tender being $30,105. Pumps will be required.

Montreal, Que.—The Dominion Bridge Co. have closed a contract for the steel work for the new 23-story Royal Bank Building, which is now under way at the corner of King and Yonge Streets, Toronto.

Moncton, N.B.—The management of the I.C.R. is making extensive preparations for the increased business expected this winter. Of the locomotive orders, fifteen go to the Montreal Locomotive Works, nine to Kingston, and five to Toronto works.

Ottawa, Ont.—Last week two Grey County contracts were awarded. A wharf at Vail's Point will be built by Grier & Creighton, of Owen Sound, and will cost $6,983. The revetment wall at Meaford will be extended at a cost of $30,000. Greene and Woolerich, of Owen Sound, are the contractors.

Ottawa, Ont.—The Cabinet have awarded the following contracts: Canadian Dredging Co.—No. 5 section of the new Welland Canal, $1,945,788; Maritime Dredging and Construction Co.—Wharf extension and dredging at Chocolate Cove, $26,879; C. Webb & Son—Addition and alterations to Orillia public buildings, $31,485; Maritime Dredging and Construction Co.—Breakwater at Little Dipper Harbor, N.B., $10,593.

Municipal

Dawson, Yukon.—The city is contemplating the purchase of water, light and telephone plants.

Yarmouth, N.S.—The town will spend about $3,340 on a pumping plant. S. C. Hood is the mayor.

Edmonton, Alta.—The city will probably be in the market shortly for a supply of water meters.

Beausejour, Man. — The ratepayers have passed a by-law to grant $3,000 for an electric light system.

Chatham, Ont.—The city will bonus The Summers Bros. Match Co., Saginaw, Mich. Voting, December 15.

Maisonneuve, Que.—The city will reorganize its fire department, and will buy the best apparatus available.

Mimico, Ont.—A by-law to raise $75,000 for a waterworks and sewerage system is being drafted by Clerk Jackson.

Dauphin, Man.—The ratepayers have passed a by-law to grant $20,000 for the extension of the electric light and power plant.

Hamilton, Ont.—The ratepayers will vote in January on the building of an incline railway at the head of Sherman Avenue.

Kingston, Ont.—The Utilities Committee will consult with a Hydro-Electric engineer re a new pump for the waterworks.

Montreal, Que.—The Council have passed a by-law to grant $2,000,000 for the purpose of establishing a municipal electric plant.

Medicine Hat, Alta.—The ratepayers have voted $1,500,000 for next year's work, and have granted concessions to a drinking fountain factory to locate here.

Ottawa, Ont.—The first contract in connection with the Gatineau water project will be let in about six weeks. The first construction contract will be let about April 1.

Montreal, Que.—A garbage reduction plant has been recommended by R. S. Lea, consulting engineer. He would build it outside the city, and haul the garbage by rail.

Toronto, Ont.—It is proposed to widen Yonge Street, in North Toronto, to 86 ft. G. W. Mountain, chief engineer of the Dominion Board of Railway Commissioners, made an inspection of the ground last week.

Toronto, Ont.—That a by-law providing for erection of a $200,000 municipal hospital in Riverdale be submitted to the ratepayers on January 1st is the effect of a motion which Ald. Rowland will introduce at the next session of the City Council.

Oak Bay, B.C.—The ratepayers have voted $150,000 for sewer purposes; $35,000 for a water supply. The engineer has been instructed to purchase pumps for sewage, and to call tenders for water mains.

St. Thomas, Ont.—J. T. Lynn, the natural gas expert of Detroit, was in St. Thomas last week, making a study of the city gas plant and the system of mains, preparatory to preparing for the Council an expert estimate of the cost of bringing the system up to date.

London, Ont.—The city has agreed to take gas from the Southern Ontario Natural Gas Co. and the City Gas Co. at 50 cents per 1,000 ft. for first six months and 45 cents thereafter. The contract is for five years. J. C. McDowell, Pittsburgh, Pa., is president. Both the company and the city will require piping.

Edmonton, Alta. — Ratepayers will vote December 8 upon two proposals, both designed to supply natural gas to consumers at low rate, as follows: The Pelican Oil and Gas Co. at 15 cents a thousand feet, delivery November 1, 1913, or to expend about $300,000 for exploration work under municipal direction in the Vegreville and other fields.

Engineering Workshop Organization and Development*

By Hans Renold

After referring to the work of Mr. Fred Taylor, to whom he gives the credit for originating a systematic method of business organization, the author enumerates the necessary spade operations before systematic management becomes possible. He submitted to the meeting an interesting series of charts showing the organization of the Renold chain-making works at Manchester where no help from a professional adviser was called in, and incidentally stated that the system adopted had been developed by men grown up and engaged in the business during its existence of thirty-four years.

THERE is probably no large business establishment anywhere to-day but calls in a professional public accountant to audit its commercial books and prepare the yearly balance sheet. This, however, was not always so.

In the United States during the last 15 or 20 years, another kind of public profession has begun to establish itself, is growing, and is made more use of year by year. It is not only used by engineering firms, but by all sorts of businesses, such as railways, publishing houses and every sort of commercial and industrial establishment. The profession I refer to is that of the public business organizer.

The Public Business Organizer.

I believe these business organizers had their beginning some 20 years ago with Fred Taylor, when he was manager of a large iron and machine works in Philadelphia. Through pressure of orders, he had to face the problem of how to get more work out of his shop than had ever been produced without increase of men or machinery. In a sense, Mr. Taylor showed himself intensely practical by being able, though a manager of a large concern with a widely varied product, to observe and analyze the minutest movements of the work performed by his men when tending the various machines, such as small and large lathes, milling, drilling and planing machines, etc., etc.

Mr. Taylor, amongst a great variety of investigations, also observed, studied and classified the movements of the navvy and his output. He compared the work done by a small and a large man when handling a small, large or medium sized spade or pick. He also investigated the movements of the bricksetter laying bricks in his customary way, and found that it was possible to eliminate 16 movements, utterly unnecessary, and, therefore, wasting a considerable part of the man's energy.

Investigations of every-day workshop operations, and tabulating the results, have shown Mr. Taylor that often a two and three times larger and better production could be obtained with a gain to both, and without hurt to either man or master, provided an intelligent administration, with a reasonable and sympathetic handling of men and machines was adopted.

Many readers no doubt have heard both good and bad reports about the so-called Taylor system. I am also acquainted with workshops, which have made attempts to modernise their shop methods, which led to very varied, and in some cases, very disappointing results.

Causes of Failure.

When looking more closely into these cases where unsatisfactory results were obtained, I have invariably found that it was not the idea nor the system that was at fault, but the way they were handled. The underlying principles were not fully understood, and results were expected before the necessary preliminary spade work had been done.

More often than not, when difficulties arose, it was because the common respect, which every man owes to his fellow-worker, was wanting, and, therefore, the necessary tact for a successful management was non-existent. Many masters did not sufficiently realize this, nor did they make it sufficiently clear to their men the new and altered conditions under which the work had now to be done. The workman's natural slowness and hesitancy to adopt new methods, his suspicions, well or ill-founded, were not taken sufficiently into account.

Sometimes when the profit became considerable, owing to a more systematic working, a fair and adequate share was not allotted to their working men. All parties to a successful working should clearly understand what is expected of each, and not the least of the managerial duty is to explain to the workman that his share of remuneration can only be a part of the benefits derived, and that the extra gains are due to a number of contributory causes.

Tactful Leadership Necessary.

Quite a staff of clerks and trained men, with a good technical knowledge, are required to prepare data and charts of the work as hitherto done, and for planning how to be done in future. There is no denying that the working of an efficient system requires men of tact and power to lead, who can command and should receive a salary which will absorb not a small part of the extra gains obtained. In short, the additional production both in quantity and quality is not all gain that goes into the master's pocket, as unfortunately there is some danger that the misguided, not too intelligent working man is led to believe by some of his leaders, who can only live and hold their posts by the ignorance of some of the men they try to mislead.

Personal Experiences.

Relating my personal experience of a fairly large engineering works in America, I may state that some five or six years ago the managers were so impressed by the wisdom and economic results foreshadowed by the Taylor system, that they decided to accept it, and tumbled headlong into it. Naturally, a hasty adoption brought, for a long time, nothing but confusion, disappointment and failure. To extricate this firm from its difficulties and trouble, it took the organizing engineer some three years to bring about some better results. Their difficulties were naturally all the greater because they had so suddenly abandoned their old and tried ways of shop management, and adopted, without the necessary tact and caution, new methods only half understood.

Spade Work Necessary.

Under the headings 1, 2, 3, 4 and 5 I have enumerated some of the necessary spade work requiring study and time before a systematic management becomes possible.

1.—The hundred and one small tools and appliances necessary to carry on the diverse operations of an engineering shop should first be studied as to what is their best form and shape for the work to be done, then to standardize and adopt them. Their sizes should be reduced to a reasonable number, and a stock kept ready in the stores to be given out when required. Duplicating is so much cheaper than making single individual tools.

2.—In far too many instances laborers and workman need more or less training. They need to be shown how to go about their work, and how to serve their machines to obtain the greatest efficiency. The manner in which cutting tools should be ground and used must be explained, or, better still, arrangements

*From a paper read recently before the Manchester (Eng.) Association of Engineers.

made so that all cutting tools are ground by one man only on special grinding machines. Newly ground tools should daily be given out from stores and carried by messenger boys to the machine men, so that there is no need for them ever to leave their machines and waste their own and much more valuable time. A system of electric call bells offers great advantages, and when once installed, will never be given up again.

3.—The best method of fixing a piece of work, the course to be followed when machining, and what is the most suitable machine for the work to be done are other points. The machines should be kept in such a state of repair that they can really perform the work expected from them. Neglected repairs have a twofold bad effect. They curtail production and lower the quality of work, but what is still more important, they make the workmen dissatisfied, as they cannot steadily pursue their work, nor earn what is their due.

4.—Speed and feed charts ought to be established for the various machines doing work on pieces differing as to size, structure and material. Attention to the grouping of machinery about the works is of great importance. To obtain the most economical results with least waste of time and effort, carting of the work to and fro unnecessarily should be avoided.

5.—Where to locate stores and how supplies and work should be given out are very important points, often requiring not a little study and organization.

Success Follows Attention to Preliminaries.

All these five points are preliminaries, and form, as I have called them, the spade work, before a systematic management can begin, and beneficial results be shown. This spring when I again visited the firm mentioned above, who had adopted the Taylor system too hurriedly, and when only half prepared, I found that they were then in a fair way of making a success of it. The work they now produce is at a greatly reduced cost, in very much larger quantities for the plant they possess, and their work is of greatly improved quality. Everybody —management and workmen — were much happier, full of interest in the work they were doing, and keenly alive to the fact that a great deal more was yet possible; in fact, they all felt to be at the beginning of a new era.

On my recent visit to the States I also spent a little time with a friend of many years' standing. He is the technical head of perhaps the largest machine company making typewriters. They have four factories in different States, a considerable distance apart from each other. The reorganization of all four works had recently been finished by a public professional business organizer, adopting the so-called Taylor system. As a consequence, they are able to-day to show economic results well-nigh incredible. Some cost figures were shown to me, which I would have doubted, had I not so well known the people from whom this information came.

When the professional business organizer first began his work in these four factories, for many months he could do nothing more than spend his time in consultation with the heads of the various departments and collect data about the work as hitherto done, and tabulate the results. Naturally it took months before a full grip was obtained of the ways the factories were run and before improvements could be suggested, some of which demanded quite radical changes in the machines used, the personnel of the staff and the class of workers employed. Some improvements of details, standardizing of tools and appliances, methods of store and stock—ordering, keeping and giving out—could, of course, be introduced in the very early days when he began work. A system of card indexes and special stationery could very easily be adopted in the drawing offices, cost and bookkeeping departments, and their methods and routine of work improved.

Organization Development.

It goes without saying that organizing large works can never be said to be really finished; still a tolerably complete state of organization can be reached in from two to three years, but it must be taken in hand energetically and with spirit. Very often it is well to retain the services of the professional business organizer as a permanent part of the system, and he then makes a visit of one or two days every month. Thus the man who has conceived and worked out the system has an opportunity to see how his work is carried out, and what modifications time and experience may suggest in the different departments. Often from time to time he can make modifications and improvements, which occur to him through working in other manufacturing concerns, although they may be producing widely different articles from what typewriting factories make.

I have had the pleasure of meeting Mr. Fred Taylor three times. The first time was some 15 years ago, when, still manager of the Midvale works, he had developed a process for hardening ordinary carbon tool steel giving results nearly as good as we obtain from high-speed cutting steel, which to-day can be bought from almost every steel maker. Mr. Taylor has long ceased to be manager, and has begun business as professional adviser, to reorganize especially engineering works, or, as the Americans like to call it, to modernize them. His firm, however, is to-day ready to undertake almost any kind of business that needs bringing up-to-date. I have spent a whole afternoon this spring in the largest and most modern publishing and printing house in existence, which Mr. Taylor's firm have not only organized, but helped to design from the very beginning when new quarters had to be built.

So far I have used the name of Fred Taylor only, but it must not be thought that he has a monopoly as professional adviser in America. There are hundreds or men to-day—all more or less his disciples—working on his lines and specializing on all kinds of businesses. As far as I know, Mr. Fred Taylor is the first who advocated and introduced a scientific and systematic workshop management, and greatly owing to his enthusiastic personality, has obtained most astonishing results. His enthusiastic work, logical thinking, and the great results obtained, sometimes lead him, when he sees in his mind "the highly developed workshop of the future," to write in a strain which an ordinary workshop manager cannot understand. In such cases Mr. Taylor is often condemned and called a crank, a fanatic or a visionary.

Coming now more intimately to the subject indicated by the heading of my paper, I must begin by stating that the organization of an engineering works is far too big a subject to do more than just touch upon a few of its main points. How could it be otherwise, when one sees the great difference there is in the work done by a large Lancashire textile machine firm, a shipbuilding yard, a sewing, machine manufactury, steam, gas and oil engine works, a machine tool shop, or a place where cycles, motor cars and wagons are manufactured.

Definition of Scientific Management.

Scientific management is neither more nor less than common sense, tabulated and applied with tact and reason when facing the every-day problems as they arise in engineering works, such as enumerated above.

The organization of an up-to-date works, therefore, must be a living organism, adjusting itself constantly to the varying demands made upon it. It must grow with the size of the business and change with the ever-changing demands made by the public for the articles manufactured. The details of an organization must naturally be very different when the articles have to be produced in large masses, in small quantities, or in single pieces, each different to the other. To a society composed of practical men, it would be of very little interest, and certainly of little use were this paper to contain a mass of generalities, stating that this and that should be done and so and so be avoided.

The system adopted by my firm has been developed during a number of years by men grown up and engaged in the business during an existence of thirty-four years.

Cultivating Apprentices.

One great and helpful element in our organization is the fact that from an early date we have taken great care with young men and have established a carefully graded apprenticeship system offering every facility for learning, and giving liberal remunerations, which are always attractive to ambitious youths. We thus secured a good supply of young men of good character, very often the sons of our own workmen and foremen. We specially looked out for students and graduates from technical schools and universities, and in many cases found amongst these our future leaders and best workers.

I need hardly say that we never thought of adopting the custom, which at one time was far too prevalent, of asking a premium for an apprentice. We early recognized that for making good business men and engineers, energetic young men of poor or middle-class parents, who have made some struggle to get a good secondary or higher grade education, were more desirable than those who could pay a premium.

Organization Features.

The business organization is that of a private company established in 1879. From a very small beginning it steadily grew, until to-day it employs some 1,300 men and women all told, and is carried on in two works—the old one in Manchester and the new one some four and a half miles outside the city among green fields with plenty of light and good air. I need hardly say that carrying on work in two places is not the most economical, nor is it conducive to establishing the best or simplest organization. However, building operations have just begun at the last named plant, with the view of moving the whole of our town works there, and thus have all our manufacturing and commercial departments together.

Product Manufactured.

The goods manufactured are driving chains used for a great many purposes. Sprockets on which these chains run are made in sizes varying from a few ounces to three and four tons. The growing difference in size and character of work done will soon demand a still greater sub-division of departments than is shown in the present charts. To carry on such a business, where new productions with new methods of manufacture are constantly called for, a large number of special machines are required, which have to be designed and constructed in our own works. Standard machine tools of ordinary design are, of course, bought, being more satisfactory and less in cost. The multitude of small tools to keep nearly 1,000 semi and full automatic machines going require also quite a large establishment for tool making.

The Commercial Department.

The marketing of our goods calls for a considerable estimating, selling, booking, and forwarding staff, which is managed by the commercial department. As chains are used in almost every country where machines and factories exist, we have not only a large home and colonial or English-speaking department, but also a small foreign department, where the correspondence is carried on in two and three foreign languages. When the business was smaller, all the three main departments were mixed up together and constituted one workshop department. More efficient working, however, soon made separation necessary. To obtain a real and accurate cost of each class of goods, sub-divisions had to be carried much further than was at first deemed necessary.

Monthly Balance Sheets.

For some time we have also been preparing monthly balance sheets, not for the commercial departments alone, but also for the manufacturing departments, and have found them of very great advantage. These monthly returns kept one constantly informed as to how the business is going, and are a great comfort in normal times, and unmistakable signposts when things are not going as they should. With a proper accountancy system, the necessary indexes are constantly kept up, and the preparing of monthly sheets then becomes the work of a few days after the month is past. With such a system of monthly balance sheets and all the returns strictly kept up-to-date, in the commercial, drawing and cost offices, and in the various stock, store, and warehouse rooms, the preparing of the yearly balance sheet is a question of only a few days more. The stopping of work for a week or ten days, necessary with the old method of yearly stock-taking, is falling out altogether, and, as is usual, a very disagreeable time for everybody is saved.

Remuneration.

I have left to the last the very important question of the system by which the workers are remunerated. Many books have been written setting forth the advantages of this or that system, and no doubt many more will be written on this subject. The fact is, no one system can be applied to advantage throughout any engineering works. As a rule, the class of work done varies too much, and the methods as to how to remunerate the men has to vary accordingly.

Giving a short account of the methods we have adopted, I would say: From the beginning of our business, for many years, we have paid all our labor by day work, which is generally admitted not to be the best system to obtain the largest production. We have done this because our first aim was to get the highest quality it was possible to obtain rather than quantity. A fair return from our workers we tried to secure by great vigilance on the part of our foremen and superintendents, who, again, were under intimate personal control of the head of the firm.

To our mind, piecework could not well be adopted, because the necessary staff and system for inspection were not then established, and was very difficult to introduce with the constantly recurring changes and improvements in quality and method of manufactures. As everybody knows, frequent changes in workmen's rates of pay are very apt to lead to discontent and difficulties, and so we kept on paying our labor by time work.

Award System.

Now as our methods of manufacture are beginning to settle down into more steady grooves, and it becomes possible to standardize our goods and fix limits to work to, and to arrive at quantities that can be steadily produced, it has become possible to devise a working system complete with inspection and accountancy. Under these more stable conditions, we are working now a system for rewarding some of our labor by results. I say "some of our labor," for in every engineering works there must be always a smaller or larger number of men who can only be paid by time work. The reward system adopted rests, broadly speaking, upon the following principles:

(1)—A man doing certain work on certain machines is rated at so much per week. At one time these rates were fixed at the price at which a man could be got. We have now developed a schedule for wages which takes into account the skill, the length of time of learning, and the laboriousness of the work he performs. These rates he is guaranteed and paid year in and year out, according to the hours he works.

(2)—In addition to the above weekly wages, in one department, for example, we pay a reward for the work above a certain quantity. The quantity at which the reward begins is usually 75 per cent. of the highest possible quantity a machine could turn out if at work without any interruption whatever. This quantity is carefully ascertained by our production engineers and clearly explained and shown to the workman how it is obtained. The workman gets the full credit of what he does above 75 per cent., and when he reaches 90 per cent. he gets an additional 50 cents for the fact of having reached so high an efficiency. The speed at which the machine should run, the feed, suitable fixings, and spare tools are all carefully thought out by the production engineers.

An assorted number of necessary fixings and tools neatly stored in special boxes are handed to each machine worker. It is in connection with such studies that we have found what considerable economic gain is obtained when the machines are chain-driven—that is, have a positive fixed ratio of speed in relation to the prime mover, and are not at the mercy of the old-fashioned leather belt, which, when slack, easily shows a loss of from 10 to 30 per cent.

All this looks simple enough, and, in fact, if used with tact and reasonableness, is very simple indeed. We have not gone through this work and study without learning how difficult it sometimes is to use the necessary tact and patience. For want of a broader outlook, some men are more or less unreasonable, and do not even understand their own true interests, and then it is that an amount of patience and tact is required, which it is well-nigh impossible to command. Unfortunately, sometimes the masters also are not much more far-seeing than the men they ought to lead.

It is wonderful what a little common sense and a kindly spirit can achieve, and I can do no better than finish my paper by repeating what I have already said, that a systematic and successful shop management is neither more nor less than:

Educated common sense, applied with method, reason, and tact to every-day problems, as they arise in our engineering works, large and small.

MEMORANDA ON AUTOMOBILE CYLINDER FOUNDING.*

By Robert Crawford.

VERY few designers of automobile engines for gasoline give the foundry end of the work any consideration, and hence it is quite common to have light and heavy sections cast together. At times this could easily be avoided, yet often not. The consequence is that chills are used, which is a practice I do not favor. I would much prefer to change the design where possible, and for the rest rely upon careful cupola practice for this class of work.

The Cupola Feature.

The first thing to watch is naturally the cupola. Of all the difficulties with which the foundryman has to contend in his melting practice, there is really nothing simpler than the cupola, and the results are absolutely safe if he know the principles underlying its proper operation. He may buy the best pig iron and scrap, but unless this material is melted right, the results will be defective in the qualities wanted. Iron will be hot and dull in turns, the coke will get the blame, and the men most interested await the heat with constant dread.

The proportions in the cupola must be properly observed. There is only one given volume of air that operates to the best advantage for every cupola diameter. It is not the blast pressure that counts, but the blast volume. If through too much air, and consequent high blast pressure for the same charging method and material, the lining is cut out badly, this should be looked after. Linings cost money, and a good blast arrangement should mean relining only once a year.

Next, by using small charges and with a proper bed thickness, there is no reason for pin holes or internal shrinkage in the work you make. It is a great mistake to work for a high melting ratio. Some men make it one to ten and others one to eight. There is but one correct ratio for each cupola and method of running to give good hot iron free from trouble-making characteristics, and when this is found, it should be held until the coke or melting stock is changed.

The importance of iron free from pin holes and shrinkage for automobile cylinder work cannot be over-rated. Those who save coke and hence melt down too low in the melting zone will realize this when they run across such castings as a piston, for instance, which may have passed through every operation up to the drilling of the hole for the wrist-pin. The inspector finds what he calls a sand hole. Study it closely and you will find it to be the result of gas in the iron. The metal has been burned in the cupola.

Another point is the great advantage of prevention as against cure. It is far better to melt right than to attempt to correct a ladle full of iron with alloys. The latter, in deoxidizing the metal, also chills it sufficiently to hold the dross and oxides formed in suspension until set, thus defeating the very object of the process.

When the cupola is kept in blast longer than two hours, it is essential that it be slagged off. Limestone of good quality cannot be excelled for this purpose. For ordinary run of melting stock, about fifteen pounds to every thousand of metal is all I use. With proper charging methods, there will be little bridging of the cupola, and hence no serious damage to the lining from the chipping necessary after a heat.

Pig Iron and Scrap.

It goes without saying, that, for automobile cylinder work, the pig iron piles should be under control as to chemical composition. You should know what your daily product analyzes, and you should further train your eye, that with a knowledge of the analysis you can note from your fractures if anything "off" is apparent. For this class of work—and I make the several parts for about fifty automobile and marine engine manufacturers—the iron should have as little shrinkage as possible, possess great durability, and show good machining qualities. I make hard iron just as every one else does at times, but, when a "kick" is registered, I investigate and straighten the matter out as rapidly as I can.

The unfortunate situation in the automobile industry is that the purchasing agent looks for cheap castings, and the foundryman simply has to use a lot of scrap of which he knows little or nothing. The result is a wailing in the machine shop which is not good to hear. Those who know will not be bluffed into this way of doing business. They will use the best of materials and charge their price. Not only has the temptation to quote a low price and then make up by using cheap scrap caused much disaster, but the advent of the automobile engineer has given us 5-32 in. and 3-16 in. water jackets, where 7-32 in. and ¼ in. had been the rule. The great strain from vibration and the gas explosions put on the cylinders, pistons and rings has proven conclusively that it is wise to start with a good foundation in the way of raw materials, and then to melt them right.

Charcoal Iron.

As to the use of charcoal irons for this class of work—being nearer to the charcoal iron market than our Eastern foundrymen—I will say that from the nature of its making, it is purer, wears better, is a close iron which will polish like steel and not cut piston or rings. On account of the expense, it is necessary to mix with coke irons, but in doing so, while making the mixture, see that the composition corresponds to the design. Melt hot and pour hot. If the metal cuts the mold, face this with material that will stand hot iron. Hot iron always gives a better casting than dull iron.

*From paper read at recent American Foundrymen's Association Convention in Chicago.

Toronto Auto Repair and Garage Co., Ltd., incorporated at Toronto, capital $40,000, to carry on the business of manufacturing carriages and vehicles of all kinds, at Toronto. Incorporators: Wilbur B. Proctor, James A. E. McDonell, etc., Toronto.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

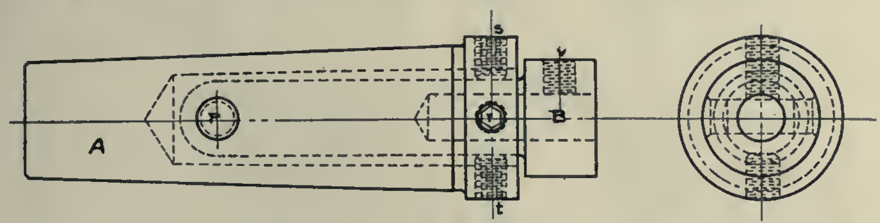
RECUTTING FILES.

WHEREVER a great amount of bench work is done, files are continually finding their way to the scrap heap before their usefulness has really been fully exhausted. When a file becomes a little dull, it is a standing invitation to poor work, and if there is any chance of obtaining a new one it is a guaranteed fact that it will not be used any longer than necessary. Some employees have a prejudice against using files that have been recut in any manner, and, of course, for fine work, they are not to be recommended. It is not necessary, however, to inform those men of the quality of the files they are using, and many of them cannot tell the difference. It certainly is a great saving to have the old files turned in and carefully sorted out so as to properly determine their disposition.

The files are first carefully cleaned of all grease and chips. A solution is made in the proportion of one part sulphuric acid to four parts of rain water and kept in a large earthenware jar. The files are immersed in this solution for varying lengths of time depending upon their condition and the pitch of the teeth. They are rinsed in warm water after being taken from the solution so as to remove all traces of the acid, then dipped in machine oil, and dried in sawdust. When carefully done, a satisfactory job will result in the majority of cases. Of course, some experimenting will be necessary to determine the exact length of time for immersion in the solution. Should the files be left in the solution too long or if the latter be too strong, the points of the teeth will be eaten away unevenly. They should be left in just long enough to bring back the cutting edges of the teeth, and if properly done, files can be recut by this method from three to four times.—D. O. Barrett.

Jig Boring Tool.

The cut shows a boring tool for use on a milling machine, and which is of simple design and easily and cheaply made. The body (A) is bored out to take the tool holder (B), allowing clearance at the sides, as shown. (B) is pivoted at the back and on the pin (P). The set screws (r), not shown in the end view, bear on flats on the sides of (B), preventing any side motion. The screws (s) and (t) form the means of adjustment, swinging the holder about the pin (P) and giving the necessary range. To get the greatest range, the job may be started with (B) clear over to the one side. At the back end (B) is prevented from moving sidewise by collars on the pin (P).—D. O. Barrett.



JIG BORING TOOL.

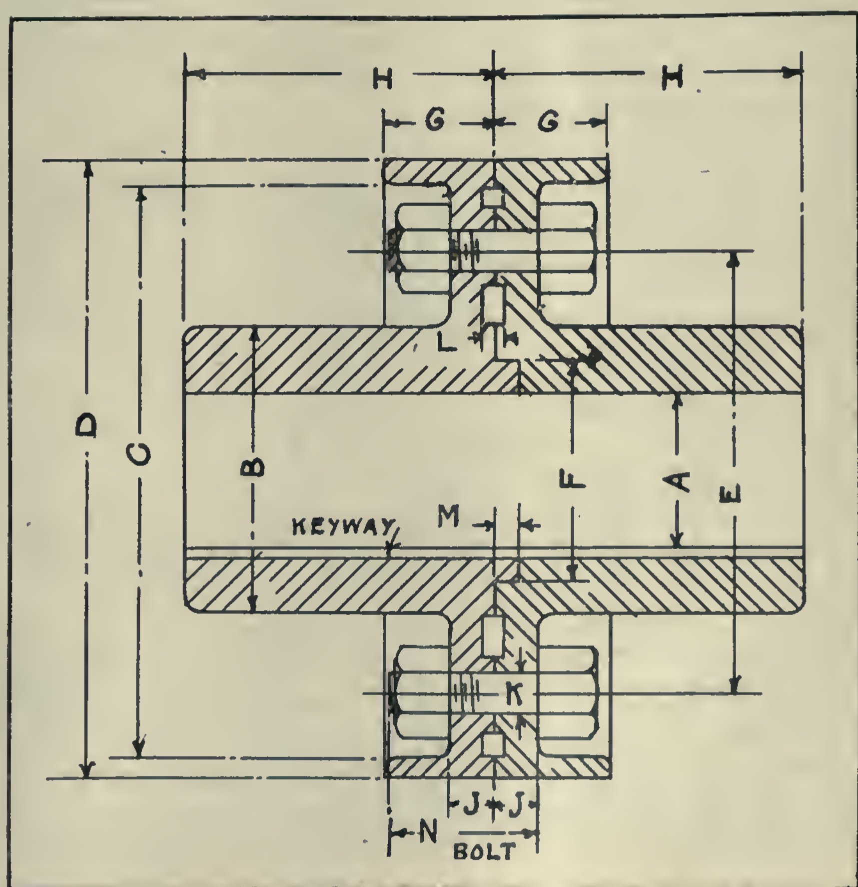
Templet and Plugs for Tapping Holes.

The best way when tapping out holes by hand on parts having planed or milled surface, is to use a templet and plug, for then the holes are always tapped true. Generally the templets used for this purpose are square pieces of steel or cast iron, having one or more holes in them. The plugs are of several varieties of length and size generally, but at best such outfits are make-shift affairs.

In the enclosed sketch is shown a neat set of plugs and a templet that can be made up and used for the purpose indi-

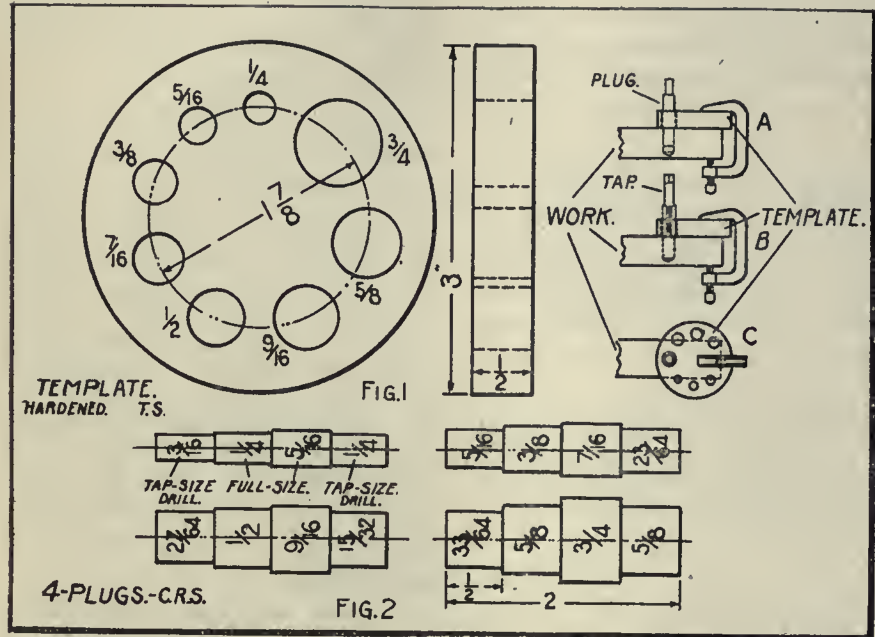
FLANGE COUPLING DATA.

A	B	C	D	E	F	G	H	J	K	L	M	N	Key	Bolts
1 11-16	3¼	6½	7	5	2½	1¼	3½	½	½	¼	¼	1¾	⅝	5
2	4	7½	8	5¾	3	1½	4	¾	⅝	¼	¼	2	⅝	5
2	4½	8¾	9½	6¾	3½	2	5	⅞	⅝	¼	¼	2¾	⅝	5
2	5½	11	11½	8½	4½	2	6	1	¾	¼	¼	3	¾	5
3	6½	12	13	9¼	4¾	2¼	7	1¾	¾	¼	⅜	3½	¾	6
3	7	14	15	10½	5⅛	2½	8	1½	⅞	¼	⅜	3¾	1	6



cated. Fig. 1, the templet, is a tool steel disk, 3 in. diameter and ½ in. thick, having 8 full size holes for taps ¼ in. to ¾ in. inclusive. The edges of the holes are about ¼ in. apart. The end diameters of the plugs, Fig. 2, are made tap-drill size for U. S. standard taps.

The method of using the templet and plugs is as follows:—The templet with a hole of the same diameter as the tap to be used is placed over the hole to be tapped in the work; then a plug having the same diameter also as the hole in the templet, and whose end diameter is the same as the hole in the work, is inserted in these two holes, locating them together. The templet is afterwards clamped to the work, the plug removed, and the tap put in, as shown at (A) and (B), (C) is a top view of the templet clamped to the work. When the tap has become started-in sufficiently to require no guide, the templet should be removed to save wear both on itself and on the tap teeth.—James E. Cooley.



TEMPLET AND PLUGS FOR TAPPING HOLES.

Boring Out Engine Crossheads.

I was put in charge of a machine shop building steam engines. One of the first things I noticed was the haphazard way the crossheads were machined; hardly ever two being interchangeable. The method in operation was to bore the gudgeon pinhole with the casting fixed on parallel strips on face plate. In boring piston rod hole, the casting was reset on strips with the gudgeon pin hole parallel with the face plate. All the holes were bored with flat drills, and the whole method employed was dependent upon the skill of the workman. My idea was to provide jigs and tools whereby it would be difficult to go wrong.

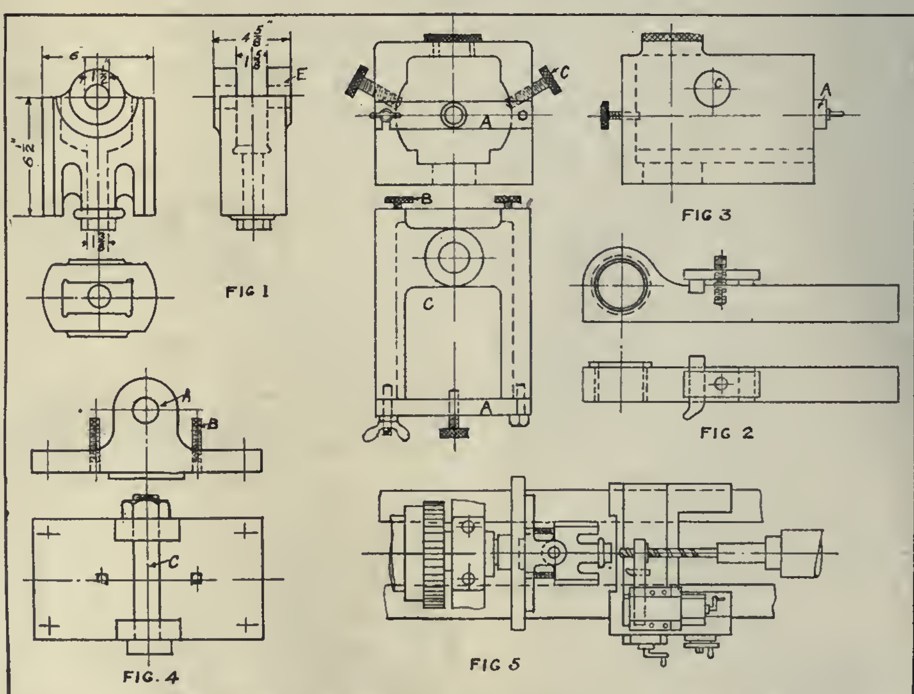
The first thing I did was to make a new crosshead pattern of cast iron. I had it properly machined and finished, so as to ensure a good clean casting to work from. Fig. 1 shows crosshead, while Fig. 2 illustrates the tool-holder and drill guide for boring and facing piston rod hole.

To make the drill guide, secure a piece of wrought iron, machine it on bottom, and drill out hole so as to pass a cutter bar through. It is next bored and faced to take a hardened steel bush. The boring must be done with the boring bar on the lathe centres, also in the lathe on which it is intended to use the guide. When this has been done, drill holes for dowel pins where convenient, as these will save a lot of time in setting. Fig. 3 is the jig for drilling the gudgeon pin hole, the sketch showing plainly the construction. No spanners are necessary to fix the casting in jig, it being held rigid with knurled screws. The plate marked (A) is a swing attachment, one turn of the wring nut allowing the casting to come ... of the jig. Fig. 4 is an easily made jig, the spigot being made to fit recess in face plate. When boring hole marked (A), it must be absolutely square with face. Fig. 3 was used in a drill press, and Fig. 4 in a lathe, the reason being that these two machine tools adjoined each other, and the drill press was not, in this case, considered capable of drilling the piston rod hole. Fig. 5 shows the casting ready for boring in the lathe.

When preparing to bore, fix in jig and set with adjusting screws. Drilling can then be started, as no other clamping is necessary. Bore out with drill .010 under standard size and finish with reamer. Face up with tool held in drill guide; this saves time in changing. Accurate work and increased output were the result of the foregoing equipment in service.—W. Womersley.

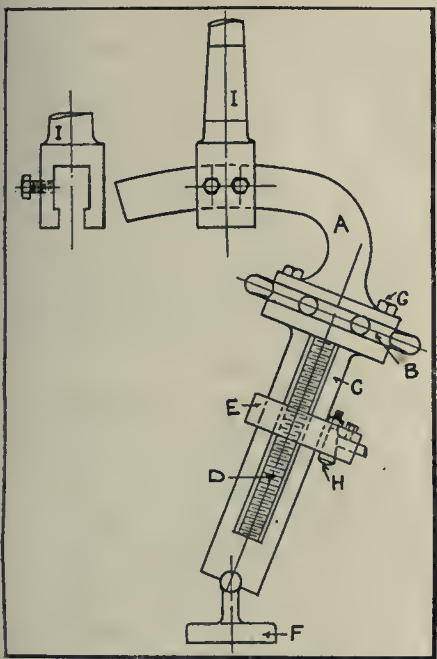
Taper Boring on the Drill Press.

A good tool for boring large taper holes is here shown. The head is made to fit the machine spindle, and arm (A) is made to fit the head, being held in desired position by set screws. Self-feed is effected by the star arrangement (B),



BORING OUT ENGINE CROSSHEADS.

a striking rod being fixed off the drill press table. The part (C) is attached to arm (A) by three small columns (G), these columns being of such a length as to allow the star (B) to move freely. The end of the feed screw (D.) contains a small pinion which gears into another



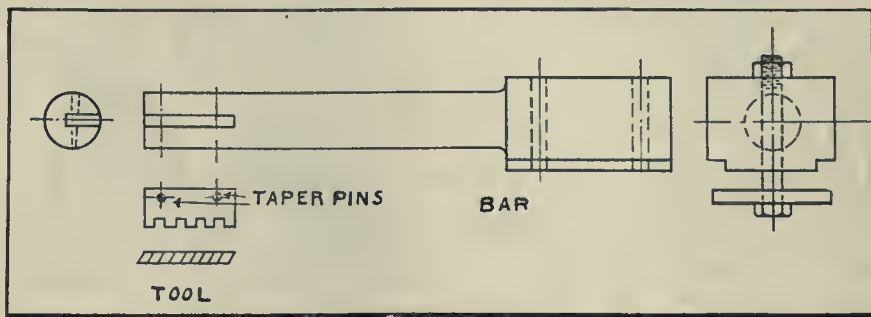
DRILL PRESS TAPER BORING APPARATUS.

pinion (J) and star (B). The tool holder (E) is made for ½ in. square tools, and the depth of cut is regulated by the cotter (H). The feed nut is held to the tool holder by means of bar (K), while the centre (F) is fastened to the drill press table. The ball end of the latter must be hardened.—H. Womersley.

Quadruple Threaded Nut Kink.

The following is a little kink which may not be new, although I have never seen it applied as herein given:—We recently bid successfully on a job in which was included a lot of brass nuts 1½ in. lead quadruple thread. The usual way of cutting a quadruple or other than single thread is to make some indexing arrangement either on the face plate or with the lathe gears so that the threads will be accurately spaced when cutting with a single pointed tool. The quantity we had to make was large enough to stand the cost of making special tools, which we did, and we saved thereby enough time to pay for the tools and add to our profit.

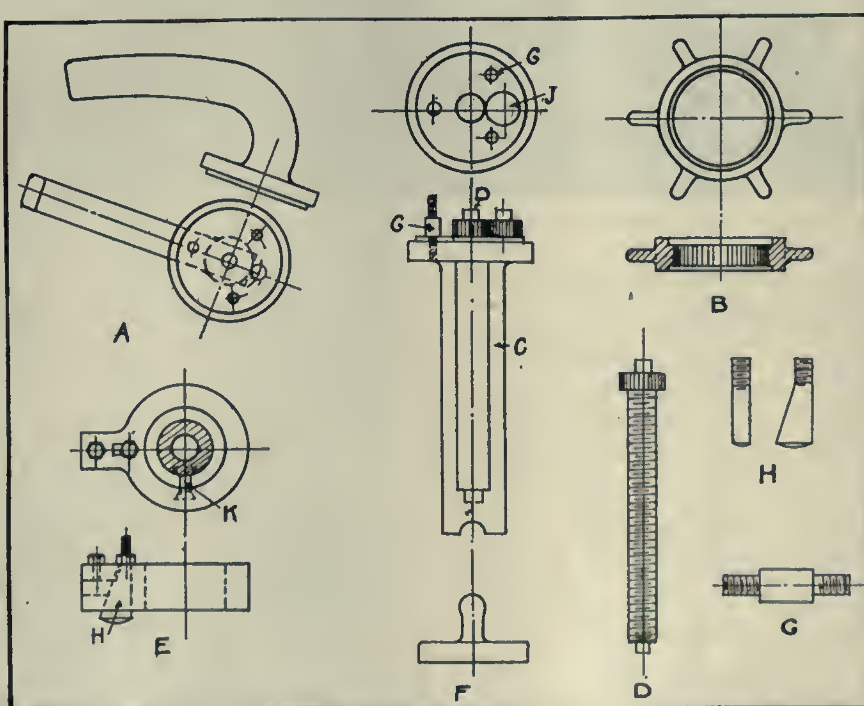
We made a good stiff boring bar out of 2 in. square iron; turned up enough of one end to go through the job and planed the square end with a tongue to fit on the slide rest so as to keep it from twisting under the strain of the cut. We milled a slot in the tool end, into which we inserted a five-toothed piece of tool steel to cut the thread; the teeth being spaced and milled for the lead and angle of the thread. In cutting the thread, we set the lathe gears for the required lead, and used the tool in the ordinary way, but instead of cutting one groove at a time we cut four (the fifth tooth on the tool was merely precautionary in case of breakage), finishing the thread complete in quarter the time taken if doing it the ordinary way. It would not pay to make this rig for a small quantity, although in some cases it would be as cheap as an indexing jig. The writer is of the opinion, however, that this method of cutting quadruple or triple threads will appeal strongly to certain of our railroad shop readers, and is certain that the method is not in use in a town where there are three locomotive shops.—Retals.



QUADRUPLE THREADED NUT KINK.

Stationary Engineer Certificates.

In a little while it will be necessary for men operating stationary engines in the province of Quebec to know something about an engine. If the bill that the Hon. Mr. Taschereau, Minister of Public Works, is framing passes the House, operative engineers will in future be required to pass a difficult examination before a Provincial Board to secure a certificate. At present certificates are granted, but it does not require much skill to secure one. Under the New Law, stationary engineers' certificates will be classified in three or four grades, and the granting of these will be in the hands of an efficient Board, the members of which will hold periodical examinations in different parts of the Province. It is hoped that this step will lead to a reciprocal arrangement by which the holder of a certificate in Quebec will be recognized in other Provinces as being qualified to have charge of a stationary engine. This reform has been effected by the stationary engineers of Montreal and Quebec city, who are to be congratulated. For a long time they have suffered an injustice because certificates were being granted following examinations which are alleged to have been far too elementary. These certificates will be renewable every year.



DRILL PRESS TAPER BORING APPARATUS DETAIL.

DEVELOPMENTS IN MACHINERY

A Record of New and Improved Machinery Tending Towards Higher Quality and Economical Production in the Machine Shop, Blacksmith Shop or Planing Mill.

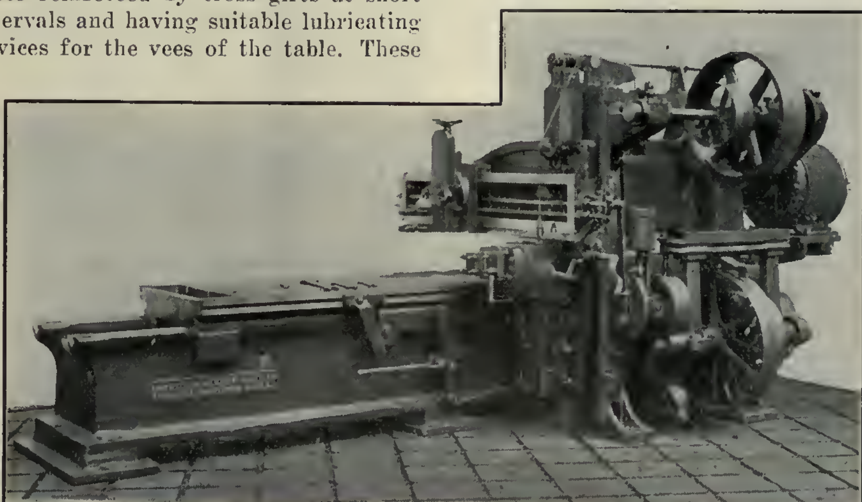
NEW 36-IN. OPEN-SIDE PLANING MACHINE.

A THIRTY-SIX inch open-side planing machine of somewhat unusual construction has been developed by the Detrick & Harvey Machine Co., Baltimore, Md. This machine was designed to conform to the Government specification for the naval repair ships and three have already been installed. The machine was required to plane a surface 36 in. wide on a piece 24 in. high and 8 ft. long. It is provided with a head on the cross rail, having hand and power, horizontal, vertical and angular feeds, and a side head having vertical hand and power feeds and a horizontal hand adjustment. By placing the cross rail head at an angle, the width of the surface which can be handled by the machine is increased to 50 inches.

The bed of the machine is a single piece reinforced by cross girts at short intervals and having suitable lubricating devices for the vees of the table. These are spaced 21 in. on centres, and are $4\frac{1}{2}$ in. wide at the top, with an included angle of 90 deg. The bed measures 152 in. between the end pockets and contains the bronze bushed bearings for the driving shaft. The table is 32 in. wide, 8 in. deep and 8 ft. long between the end pockets. Three planed T-slots are provided in the top, as well as a number of rectangular cored stop holes. It is gibbed down on both sides at the cutting point to prevent lifting.

The post is of box cross-section, reinforced at both the front and the rear for the full height by extensions. It extends to the floor line as the chief supporting member of the principal parts, and is tongued and bolted to a cheek on the bed, this arrangement of vertical fit being relied on to offer direct resistance to the pressure of the cut and reduce the torsional strain in the post to a minimum. An L-shaped casting, having a vertical leg bearing on the face of the post $11\frac{1}{4}$ in. wide and 51 in. long, is used for the cross beam. The length of the vertical support of the cross beam is approximately 1 1-3 times that of the overhanging arm, and the horizontal face is cast integral with the vertical leg.

A triangular brace secured to the rear surface of the overhanging portion and extending to an inner face on the rear of the post furnishes an additional support for the cross beam, it being possible to securely clamp it in place. The portion of the vertical leg of the cross beam which projects down from the horizontal slideway has a slideway on its front face for mounting the side head, this arrangement being employed to reduce the distance from the cutting tool to its final supporting member to a minimum.



DETRICK & HARVEY OPEN SIDE PLANER.

The drive is of the Sellers worm-type and the machine is driven by a 10-h.p. constant-speed motor. This is direct connected through a silent chain drive to the countershaft bracket attached to the planer post. The countershaft revolves in a plane parallel to the line of table travel and the power is then transmitted through a pair of bevel gears to a diagonal shaft upon which is mounted a multiple thread worm, engaging the rack under the table. The speed of the worm is 2.08 r.p.m. and that of the machine pulley is 7.20, which gives a belt speed under the cut of 57 ft. of $2\frac{1}{4}$-in. belt per foot of table speed. The cutting speed is 50 ft. per min., while the return speed is 40 ft. higher. A positive friction type of feed mechanism is employed, which consumes power only when feeding.

The floor space occupied by the machine is 9 ft. in width and 20 ft. in length, including the extreme travel of the table. The over-all height is 83 in. The machine, together with the driving motor, weighs approximately 21,000 lb.

NEW THREE-HIGH UNIVERSAL MILL.

THE Harrisburg Pipe & Pipe Bending Co., Harrisburg, Pa., have recently designed and built a new three-high 21 in. Universal Mill for their rolling mill department. This new mill takes the place of an old 20 in. grooved mill, and is designed to roll plates from 4 in. to 18 in. wide down to .072 in. thick or No. 15 gauge.

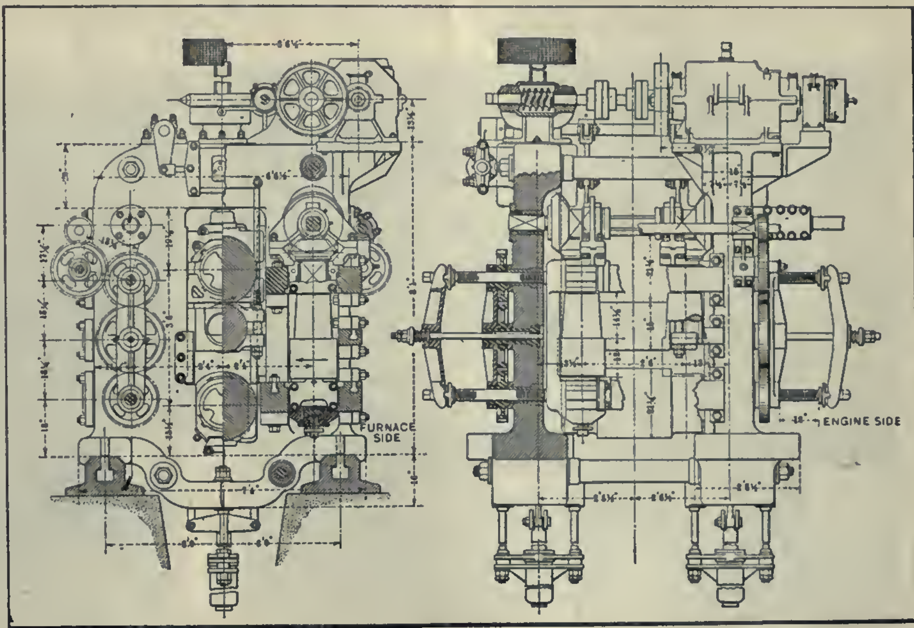
It was decided to build this mill during the early part of June of this year, and the first slab delivered to the mill on September 29 was successfully rolled to width and gauge. This is somewhat remarkable both as to time and successful operation when the limited resources of the company for doing this class of work, both in the engineering department and shops, is taken into consideration.

This mill is of very heavy construction throughout, all of the parts being made over size wherever possible. The housings are made of air furnace iron and are exceedingly heavy in order to give the mill great rigidity. The boxes and practically all of the fillings are made of steel with all bearings bushed in order that repairs may be easily and quickly made. Realizing the necessity of changing the middle roll quickly, the bearings for this roll are made removable from the outside, and by means of a special balancing apparatus, this roll can be removed from its position and a new one put in place in a very short time. The vertical rolls are also designed with the idea of rapid removal.

In order to make this change, the bonnets are removed from the yokes carrying the bevel gears, the rest bars from the front of the mill are removed, and the vertical rolls taken from their housings and new ones put in their place. Special attention was paid to the bottom vertical roll bearing, which, as a rule, gives considerable trouble in mills of this type. The bronze bushing is so designed that it extends up into a groove turned in the body of the roll so that the bearing is absolutely protected from all water and scale. Positive lubrication of this bearing is secured through a hole in the centre of the vertical roll running its entire length. Judging from the small amount of wear on the vertical rolls and their bearings during the first 5 weeks of operation, they should last several months before their removal from the mill. The working body of the vertical roll is $14\frac{1}{2}$ in. in diameter with an 8 in. diameter neck.

The main rolls are $21\frac{1}{4}$ in. in diameter with 14 in. necks, giving a very rigid roll on account of their shortness, the length of the working body of the roll being only 23 inches. The top roll is balanced in the usual manner by means of two hydraulic cylinders under the housings. It will be noticed that the middle roll is lifted by means of a hydraulic cylinder on the side of the housing, permitting of easy access for packing and making the necessary adjustments. Both the top and bottom main rolls are provided with wedges in order that the mill may be accurately leveled, and the material delivered straight. On account of the small amount of adjusting required on the vertical rolls, it will be noted that ratchets are provided for their movement in and out, although their design is such that motors may be applied at any time should occasion demand it.

with suitable gear and worm in a 16 to 1 ratio. The motor is operated with a General Electric magnetic switch control and an Electric Controller & Mfg. Co. brake.



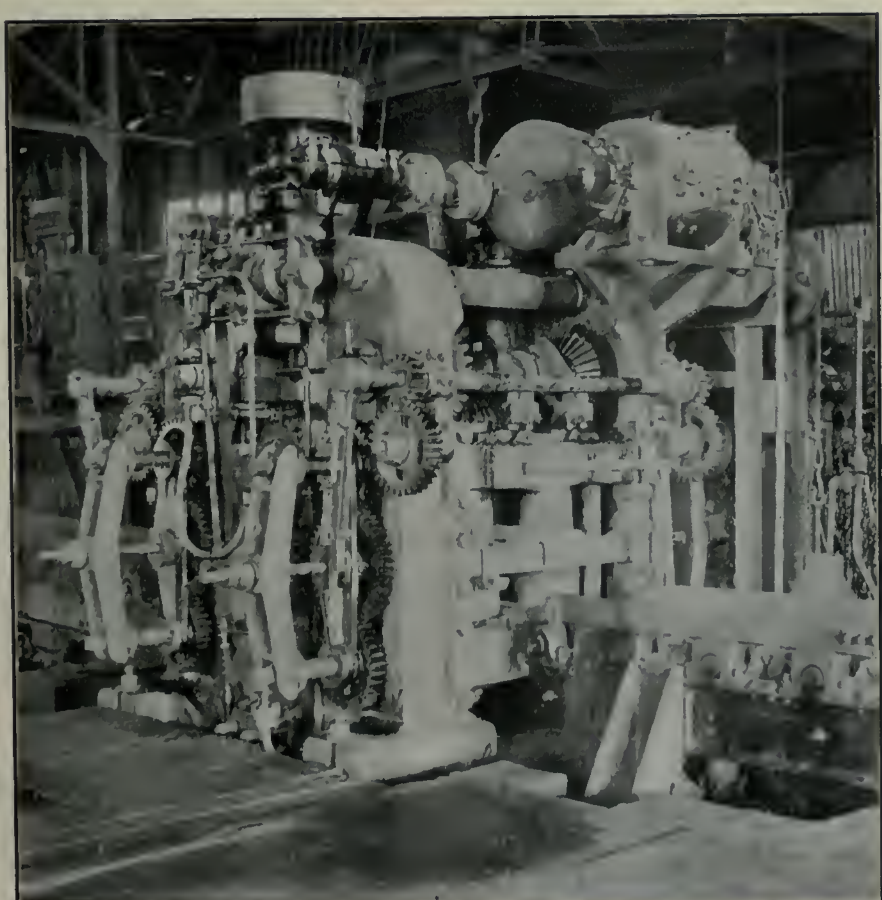
THREE HIGH UNIVERSAL PLATE MILL—CROSS SECTIONAL ELEVATIONS.

The screw-down on this mill is somewhat faster than called for by ordinary practice, the 35 h.p. Westinghouse M.C. mill motor being connected to the screws

It has been found with this control apparatus that the production of the mill is not limited or retarded by the screwsman, but is governed only by the speed of the rolls and the ability of the table runner to handle the bars in and out of the mill. The mill is operated in conjunction with a three-high bull head stand, which serves as a finisher. This bull head stand is also of a very rigid construction, and is so arranged that three reductions are obtained on it, enabling the plate or bar to be reduced to one-half its thickness.

With these two mills operating, one as a rougher and the other as a finisher, it is possible to roll down to light gauges, and at the same time produce material that is very accurate as to gauge, and also with a very fine surface finish free from scale and other defects. The necessary equipment has also been installed to ship the product of these mills in lengths cut to order or in coils as the customer may require.

The steel for this mill is made in small basic open hearth furnaces of 40 tons capacity, with the sulphur and phosphorus content running not over .03 per cent. On account of the steel being made in small furnaces and from selected pig iron and scrap, it has been found that the product of this universal mill is particularly adapted for stamping, deep drawing and cold rolling processes, or for any work where a steel of accurate analysis and great uniformity is required.



THREE HIGH 21 IN. UNIVERSAL PLATE MILL.

FLEXIBLE METHOD OF SUPPORTING SHAFTING FROM CONCRETE BEAMS.

VARIOUS methods have been employed for the support of shafting in concrete factory buildings. Most of these have been based on the use of some form of insert, and practically all of them have made it necessary to determine in advance the exact location of shafting, and have not provided any flexibility to allow for future shafting, changes or additions.

An interesting method of securing the latter, which has been used by Lockwood, Greene & Co., architects and engineers, of Boston, Mass., is clearly shown in the accompanying photographs. By this plan, a continuous groove about one inch deep and about two inches high is cast along each side of every concrete beam in the building. These are located at a uniform height from the bottom of the beam and are of uniform size. The grooves are easily made by simply nailing a cleat inside of the forms before the concrete is poured, and since the slots come, in general, below the upper half of the beam they do not detract from its strength. This method does not add appreciably to the cost of construction, and the grooves are not very noticeable.

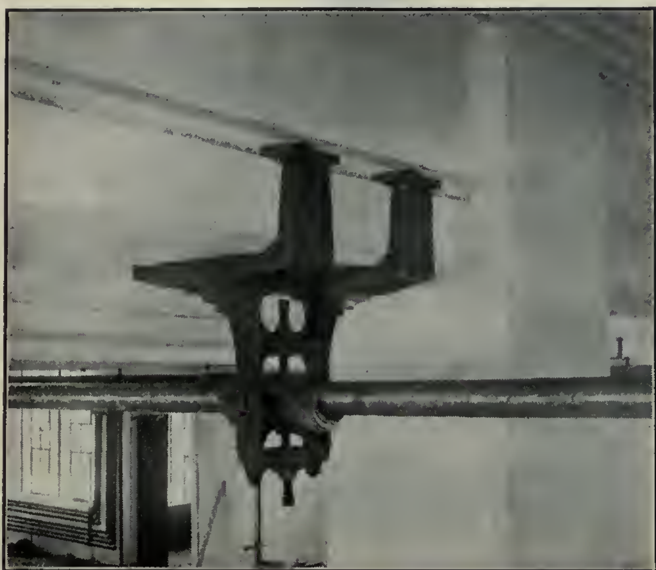


FIG. 1. HANGER AND CLAMP AT CLOSE RANGE.

FIG. 3. INTERMEDIATE HANGER ARRANGEMENT.

Clamps have been designed which fit around the inside of the beam and are held in place by bolts with plate washers at the top which fit into the grooves in the beams. The clamps are made of gray iron, and it has been found that they can be cast very cheaply after the pattern has once been made. Two of these clamps are necessary for each hanger, and since the clamps are made up independently, a pair can be spaced any distance apart, and thus be made to accommodate the foot of any hanger which it is desired to use. The photographs clearly show the form of the clamp, and the appearance of a line of shafting supported in this manner. When an intermediate hanger is desired between beams, a clamp of the same style may be used to support steel channels to which the hanger is then bolted as shown in Fig. 3.

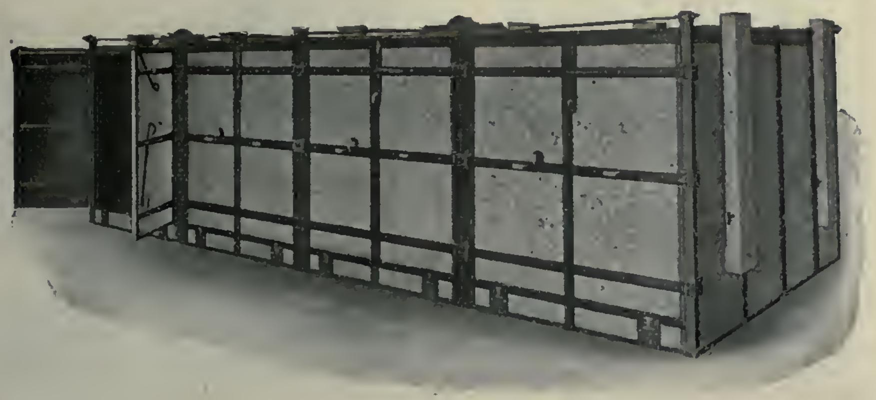
The particular advantage of this method, which is in successful use in a number of factories, lies in its flexibility in providng for changes and for future requirements.

FIG. 2. LINE SHAFTING INSTALLATION IN MACHINE SHOP.

BANK OF NEW CORE OVENS.

FOR operation by means of trucks holding from three to four tons of cores each, a new bank of ovens has just been installed for a foundry in Cleveland, O., by the Oven Equipment & Mfg. Co., New Haven, Conn. The whole equipment measures 28 feet across the front, 12 feet deep and 6½ feet high above the tracks. There are two compartments with a solid division wall between, each having two double full width doors to admit a truck of cores, which takes the full door opening.

Each compartment is heated evenly by an enclosed flame gas burner located at the centre and operated from the back side of the oven. Air under a pressure of about one pound is forced through the burner by a positive pressure blower. The superheated air thus formed makes thorough circulation throughout the entire interior of the oven, and forces steam and fumes out at the vents, such as those shown at the right end of the cut. The positive circulation and high temperature carried by this oven make it possible, we understand, to get results



BANK OF NEW CORE OVENS.

in one-half the time required when coal or coke is used. The insulation, covering all six faces of the oven, prevents the escape of heat and makes the operation extremely economical in gas.

Among the safeguards, three in particular, might be mentioned: The enclosed flame gas burner removes all danger of fire from the burner under the apparatus. The gas is burned in a steel pipe, there being no open flame anywhere. In connection with this is the automatic cut-out valve which shuts off the gas pressure whenever the air pressure falls below a predetermined point. In this way it is impossible for gas to accumulate in the oven and cause an explosion as a result of a sudden failure of the air pressure. The doors are so adjusted that they cannot be closed unless the vent dampers are open. This prevents putting a pressure on the oven without any escape for the gases.

UNIVERSAL MACHINE VISE.

THE description and illustrations refer to the Universal Machine Vise manufactured by the Brown Engineering Co., Reading, Pa.

These vises are made with deep jaws in order to assure perfect vertical alignment of any work which they are called upon to hold. The rear jaw swivels, offering four different faces to the work at any angle, while supplementary jaws are arranged to be bolted to the broad top faces of the vises for holding work of irregular shape. The top of the vise can be drilled and tapped for holding bushing holders when the vise is used as a universal jig.

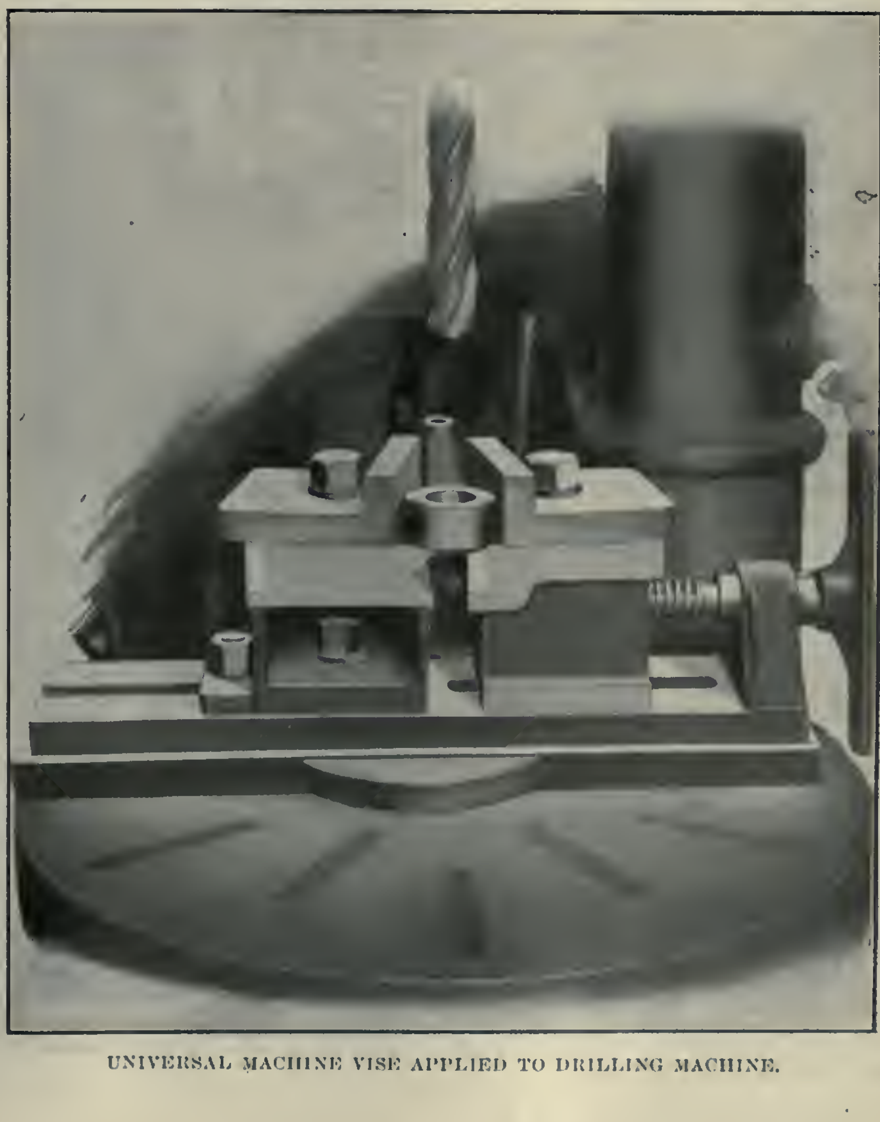
The vises are designed to save the time of high-priced workmen, otherwise wasted in hunting for clamps, angle plates, bolts, etc. They are useful in making up jigs, and are employed in the tool rooms of many large plants for this purpose. They are very useful for making up special tools, due to the fact, that they will hold almost any shape which may come up. The work can also be extended down through the base of the vise, there being a hole in same for this purpose.

For use as a jig in contract shops, manufacturing plants, and others, where 50 to 100 parts are to be drilled alike, it is a simple matter to fasten a bushing holder to the broad top of the vise which is machined off for this purpose. A stop is easily fastened to the side of the vise for properly gauging the work.

For repair work, they fill an important place, being able to hold almost any irregular shape quickly and accurately.

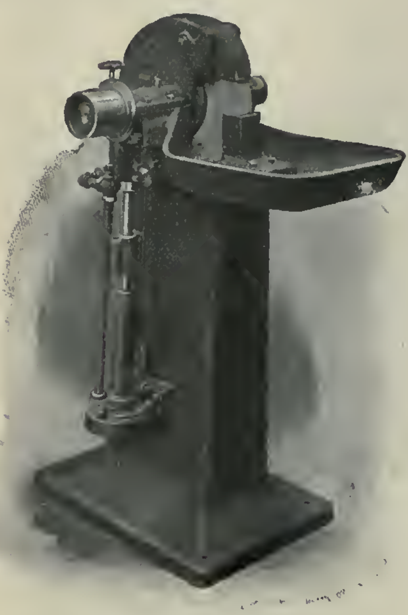
WET TOOL GRINDER.

THE 14 in. wet tool grinder here described and illustrated, has self-oiling bearings throughout. It is equipped with a vertical centrifugal pump, of snail shell design, which furnishes a constant supply of water that can be regulated to meet the requirements of all classes of work. The pump cap sleeve, which covers the pump case, loosely encircles the pump shaft and extends above the water line, thereby preventing leakage without the use of packing. The pump is driven by means of a friction pulley, which engages a flange on the inner side of the spindle drive pulley.



UNIVERSAL MACHINE VISE APPLIED TO DRILLING MACHINE.

The tank is located in the column and holds an ample supply of water. An opening in the base provides means for cleaning same when necessary.



14-IN. WET TOOL GRINDER.

This machine is built by the J. G. Blount Co., Everett, Mass., and is similar in design to their 20 in. and 30 in. wet tool grinders, but lighter in construction, tending thereby to meet the requirements of factories having lighter work. The machine can be motor driven, and occupies a floor space 32 x 24 inches.

SELF-OILED 22IN. ALL-GEARED DRILL.

THE Barnes Drill Co., Rockford, Ill., are placing on the market about the first of the New Year a self-oiled, 22-inch all-geared drill, concerning which the following description and illustration give an indication of the more prominent features. It is strictly a manufacturing drill, being strong, rigid and powerful, and built for rapid production and heavy duty. Every bearing, aside from the spindle sleeve, is self-oiled. There are eight changes of geared speeds and ten changes of geared feeds, all under instant control of the operator from front of machine. There are no cone or inherent belts to buy, slip, shift, or maintain; it is, therefore, positive and result producing in every movement. It handles high speed twist drills from ½ in. to 2 in. at suitable speeds and feeds.

All bearings, aside from the spindle sleeve and cross spindles, are automatically lubricated. Oil is pumped by a geared pump in the reservoir of the machine and distributed constantly to all gears and bearings, including the crown gears and feed box. This self-oiling system is manufactured under license from the Kearney & Trecker Co., owners of U. S. Letters Patent No. 834,063, dated October 23rd, 1906.

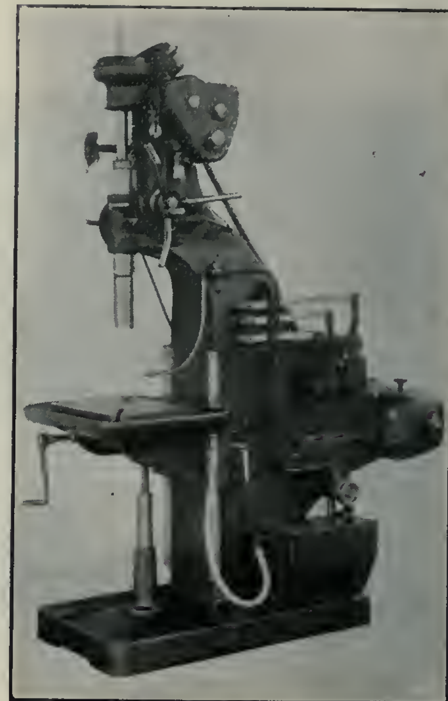
All transmission gears, aside from the friction clutch gears, including the crown gear and pinion, are cut from a special high grade steel, and are heat-treated to prevent wear and to increase strength and stiffness. There are eight changes of speeds, all controlled by levers within instant reach of operator from his position in front of the drill. The spindle may be stopped by placing shifter lever on neutral position or by throwing out the clutch gear.

There are ten instant changes of geared feeds, controlled by levers directly in front of operator, and feeds are indicated in plain figures on index dial plate. All important feed gears are cut from steel and are case-hardened. The feed gears are flooded with oil automatically. A safety collar protects the machine against damage from overload.

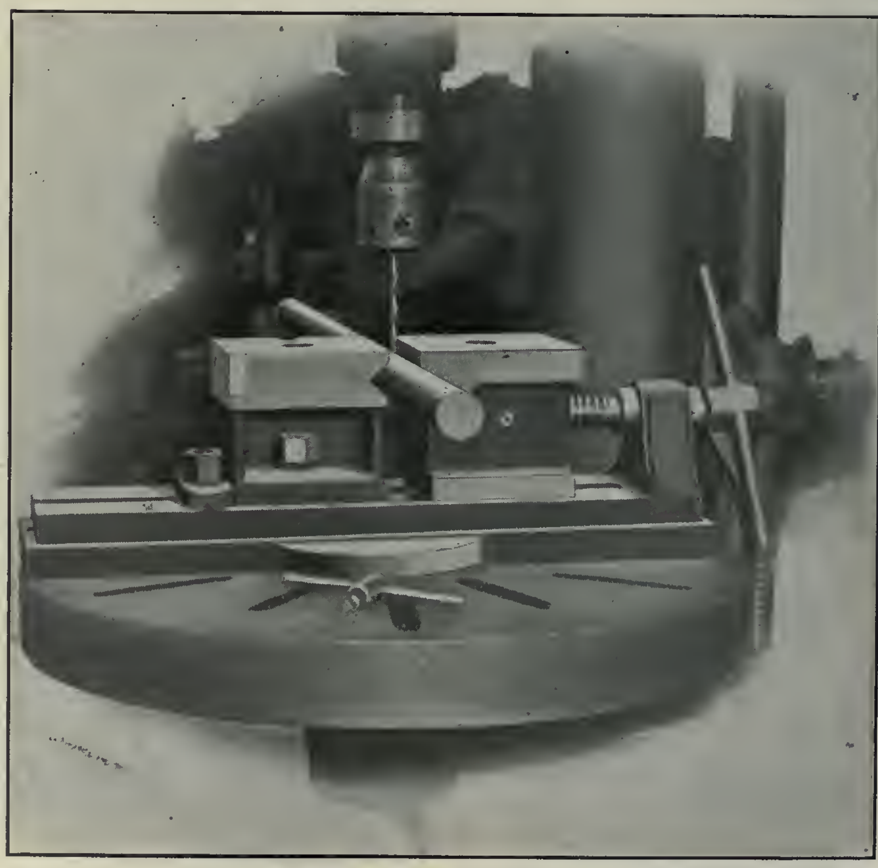
The ten feed changes are: .003, .005, .009, .013, .017, .020, .041, .065 and .093; while the eight speed changes are: Direct, 575, 456, 367, 233, and with back gears in: 144, 114, 92, and 58.

The machine is capable of driving a 13-16 inch Celfor high speed drill, running 575 r.p.m., with a feed of .041 in., through a 2 in. cast iron bar in 5 seconds, or equal to almost 24 in. per minute. It drives a 2 in. high speed drill at 144 r.p.m. with a feed of .025 inches.

The height of the machine is 85 inches, the floor space occupied is 65 by 31 inches, and the net weight, including regular table and oil pump attachment, but without motor, is 2620 pounds.



SELF OILED 22 IN. ALL GEARED DRILL.



UNIVERSAL MACHINE VISE APPLIED TO MILLER.

TRADE AND COMMERCE RECORD

Dealing With the Steps Being Taken and Progress Made by Industrial Canada To Achieve and Maintain a Dominant Place in the Markets of the World

New Fields for Steel Products.

One of the features of the steel trade in Canada during the past year has been the opening up of new fields of business by the Dominion Iron and Steel Co. Until recently its efforts had been centered on manufacturing steel rails, and for this product it found a ready market in the big railway corporations which have been extending their lines at an abnormal rate during the past few years. The building of transcontinental railways cannot, however, go on for ever, and the demand for rails in this country will not always be greater than the supply. There is another important factor in this expansion. Previously, the Steel Company of Canada purchased their rods from the Dominion Iron and Steel Co., and converted them into wire, nails, etc., at their various mills. Early this year, the former concern erected a large rod mill at Hamilton, Ont., and from that point they commenced to manufacture their own product from start to finish. This resulted in the expansion of the Dominion Steel Corporation business referred to above. The product of their rod mill had to go somewhere, and what more natural than that they should invade the field now supplied by the Steel Company of Canada. First, strong efforts were made to secure a hold in Montreal, and secondly, offices and warehouses were leased in Toronto, and wire, nails, and steel bars placed on the Ontario market. So energetically has the business been pushed, that a big trade has been built up, resulting in keen competition. As a result, the price of nails and wire has dropped in a most marked degree. The advent of this company int the Ontario and Montreal markets has meant a loss of business amounting to hundreds of thousands of dollars to other companies manufacturing these lines.

There is another feature of the expansion of the business done by the Dominion Iron and Steel Co. Exportation of wire to New Zealand has been frequent, and now export of nails to Australia has commenced. Last week, the S.S. Cairnross, of the New Zealand line, shipped over 400 tons of nails and wire from Sydney, N.S. for Australian ports. Thus, Canada is competing successfully with British and United States steel companies for business in the Antipodes. Both these countries export an enormous quantity of steel products to both Australia and New Zealand.

Talking about trade with Australia, it should not be forgotten that Hon. G. E. Foster spent much time there this year, endeavoring to develop trade. This is probably why Canadian trade with Australia has grown considerable during the last twelve months. Australia buys six times as much from Canada as Canada buys from Australia, and is buying more every month. Australia bought goods in the United States last year amounting to $10,083,755, and in many cases the articles purchased were just those that Canada has to sell. In view of the policy of Australia to purchase within the Empire, the future for Canadian trade with that country looks rosy.

British Manufacturers in Canada.

Some weeks ago a movement was begun to send an exhibition train from one end of Canada to the other, showing nothing but British-made goods. This resulted from the success of the Made-In-Canada train. The idea caught on at once, but the organizers have struck a snag, bringing out a fact which explains why British manufacturers do not push business in Canada, and why some of those who have entered the field have left it. A Halifax, England, engineering firm was asked to exhibit their goods on this train, and they replied in effect: "We have spent hundreds of pounds to try and find out what prospects there are for business in Canada. In a tour from one end of the Dominion to the other, our representative found that the prospect of business turned simply on the extent of credit we were prepared to give. They found that Canadian and American firms would give up to three years' credit. We had, therefore, to do the same to run a chance of getting a share of the business." What this firm says is substantially correct. The facts are there, and to do business in Canada, British firms must be prepared to give credit. Some of those who have established agencies in this country have disliked this credit so much, they have left the field, declaring that they can find just as good business with quicker returns in the Mother Country. There are others who have realized the situation, have established offices or branch plants here, and are prepared to give the credit, and get the business. Another thing the British manufacturer should know; this is that business is not secured in Canada for the mere asking. They will find keen competition from Canadian and American firms, and to secure the business they must advertise, and then go after it. A typical example of the way business is secured in Canada will be quoted for the benefit of British manufacturers who contemplate coming to Canada. A few weeks ago, the town of Davidson, Sask., required an electric light and power plant, and were willing to spend something under $10,000 for it. Money being rather scarce, they looked for a company that would grant them the most reasonable terms. The offer of an Ontario firm took their fancy. This firm agreed to equip a power plant for the sum of $8,500, and were willing to take $6,500 in the town's debentures. The local newspaper says: "The town council thinks the offer of taking up debentures is exceptionally good, and have sent their superintendent to Q———, to inspect a plant installed there by this firm. After all, of course, everything is subject to the endorsation of the ratepayers, probably some time this month, if there is no further delay."

Larger Shingle Export.

The change made recently in the United States tariff did not affect the machine tool business much in this country, but the indirect effect on the sale of woodworking machinery should be very marked. The tariff change has given a great impetus to the shingle industry, especially in the West, and this will mean the erection of more mills and a demand for more machinery. The duty of fifty cents on Canadian shingles has been entirely removed, with the result that Canadian factories are able to deliver shingles in the United States at a much lower figure than Americans could produce them.

A Motorcycle Plant.

The experience of a company who started out to manufacture motorcycles in Canada and met with difficulties, should be of interest to others starting out on similar ventures. About a year ago, the Brantford Autocycles, Ltd., was organized with a capital of $75,000 to make motorcycles. A blacksmith's shop was secured and equipped with a plentiful supply of first-class machine tools. A mechanic who had had experience in the manufacture of motorcycles was secured from Detroit, and a start made to manufacture four models. It was hoped to have these completed in a short time, and then to build a plant, but the year has been spent in turning out these models. Difficulties were encountered in securing parts from Detroit, and some of the parts made locally did not meet with approval and had to be re-made. A few weeks ago, the first model was tried out on the street, and proved to be a first class machine, powerful, a little heavy, but designed in such a manner as to be easily manipulated. The capital being almost exhausted and the models completed ,the time has arrived when another step must be taken, and now the company are undecided whether to go ahead with the erection of a plant or to have the machine made to order elsewhere.

Smoke Consumers on G.T.R.

The Grand Trunk Railway has been experimenting for some time with smoke consumers for application to locomotives, and has so far met with sufficient success to warrant equipping all the yard locomotives at Windsor, Ont., as well as a few others at different points on the system. The type used is very similar to those in use by railways in Chicago, where an anti-smoke campaign has compelled them to use some device that will materially reduce the smoke. Along the side of the firebox, from 16 to 18 ins. above the fire, there are eight tube openings. On the outside are small steam jets, so placed that the jet at the point of entering the tube creates a strong draught and carries in a volume of air over the top of the fire. The air brought in through these side openings mixes thoroughly with the smoke in the firebox immediately after it is given off from the bed of coals, and, with a bright fire burning, the smoke is almost completely consumed. In a demonstration several shovels of coal were thrown on a bright fire, resulting in dense smoke being given off. Turning on the steam through these side jets reduced the smoke almost instantaneously, so that the vapor given off at the stack was just slightly colored. The results of the experiments have been so successful that it is not at all unlikely the yard locomotives all over the system will be so equipped. The road locomotives may likewise be so equipped, but the advantages accruing are not considered to be as great as in yard locomotives, where the question of smoke in the atmosphere is of considerable importance to the community.

An Interesting Legal Point.

Whether a company can recover the amount stolen from them by an employee, for which he has been sent to jail, is a question which will be settled at Osgoode Hall, Toronto, before long. The Massey-Harris Company, the well-known Toronto firm of agricultural implement makers, have entered action in the civil courts against James H. Denison, a bookkeeper formerly in their employ, to recover $24,718.20, the amount he admitted having taken from the company's funds, which he lost in betting transactions. In the criminal court he was sentenced to three years' penal servitude.

British Trade Returns.

The following are the official figures of the trade between Canada and Great Britain in the undermentioned articles during October:

From Canada.	Oct., 1913.	Oct., 1912.
Wheat	£829,432	£897,434
Wheat meal & flour	224,549	196,424
Oats	43,530	111,480
Cattle	—	2,193
Bacon	61,120	88,675
Hams	14,148	10,473
Cheese	587,041	674,864
Canned Salmon ...	74,578	6,437
To Canada.	**Oct., 1913.**	**Oct., 1912.**
Spirits	£ 87,748	£ 96,034
Sugar	1,561	5,102
Wool	11,710	8,942
Pig iron	28,017	66,008
Ship, etc., plates...	15,605	3,163
Galvanized sheets..	36,010	58,913
Steel bars, etc.....	19,667	31,319
Pig lead	20,774	12,993
Unwrought tin	17,686	17,539
Cutlery	10,768	13,885
Hardware	11,461	14,121

An Important Judgment.

Alfred Rogers made a contract with the National Portland Cement Co., of Durham, Ont., to be their sole agent for five years from January 15, 1910. He so organized and advertised the business that his annual net profits were $18,000. When two years had elapsed the Cement Company broke the contract. They were compelled to meet the market price, and decided to offset the loss, in part at least, by reducing their expenses of selling. Mr. Rogers entered action for $54,000, being the amount of his profits for the three years the contract had yet to run. At the trial it was stated for the defence that Mr. Rogers had made use of an expression to the effect that he had terminated or would terminate the contract, but Mr. Justice Lennox, who heard the case, would not accept this evidence, and gave judgment for Rogers. A reference is directed to the Master-in-Ordinary to determine how much of the $54,000 claimed should be paid to Mr. Rogers.

Spruce Consumption for Pulp.

The abundance and cheapness of newspapers and other printed matter is one of the most salient features of our modern life. We take a complacent pride in comparing our one-cent 12-page productions with the insignificant six-penny "Times" of a hundred years ago. We seldom give it a thought that all this wealth of morning and evening editions, sporting extras, magazine sections and comic supplements is making a tremendous drain on our forests of spruce. One large daily paper in New York consumes in the course of a year as much spruce as can be cut from four to five thousand acres. If the proprietors of this newspaper maintained a forest, sufficiently large for the annual growth to supply them with all the pulp necessary for a year's consumption of paper, they would require a tract about 14 miles square.

The demand for spruce is not only large but rapidly increasing. In the United States, the cut of 1909 was double that of 1899 and six times that of 1889. It is not surprising, therefore, to learn that Mr. Pinchot has estimated that there is only from 10 to 30 years' cut in sight in the various States. Already, the production of pulpwood south of the border seems to have reached a maximum, having decreased from 1,786,000 cords in 1906 to 1,474,000 cords in 1910. This decreasing supply, operating in conjunction with the increasing demand, has led to a great augmentation in the imports from Canada.

At the present time, pulpwood is made almost entirely from spruce and principally by the mechanical process. In Canada, in 1912, the aggregate of wood used was 866,042 cords, and of this 677,747 cords were spruce. The aggregate of pulp manufactured was 682,632 tons, of which amount 499,226 tons were made mechanically. These figures represent an increase of about 44 per cent. over 1910. Canada has by no means yet reached the limit of her production, but it can only be a question of time till the operation of the same forces brings about the same situation as in the United States.

In the circumstances, the question of finding substitutes for spruce becomes of peculiar interest and it is interesting to learn that, assisted by a grant of $30,000 from Congress, experiments are now being carried on in Wisconsin with a view to testing the efficacy of such woods as hemlock and jackpine as substitutes for spruce in the manufacture of paper-pulp. With regard to jackpine, it may be said that if it could be utilized in the making of paper, we might turn to profitable account a tree which, at present, has very little commercial value.

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Toronto—143-149 University Ave. Telephone Main 7324.
Winnipeg—34 Royal Bank Building. Phone Garry 2313.
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Vol. X. DECEMBER 4, 1913 No. 23

PRINCIPAL CONTENTS.

ALL FOR THE BEST.

WHEN trouble of one kind or another overtakes us as individuals, no matter how distressing its effects, or when disaster stupendous in its scope and dire in its results shakes from the foundation communities or even nations, those of us, who have on the particular occasion evaded the onslaught, are prone to give expression to the consolatory phrase—"It is no doubt all for the best." We have, from a date unplaced, because away back in our memory, become so accustomed to hear about if not to experience more or less trouble and disaster, and have imbibed and been trained towards the cultivation of a spirit of resignation to the will of a Supreme Being, that much of the purpose and aim of the varied lesser or greater calamities which beset our being passes unnoticed, and therefore unheeded. A well known modern writer recently wrote that "the streak of truth in **All for the Best** was rather a curious one," and goes on to say that people are still talking education, by which sensible people mean learning something, and silly people mean learning anything.

At no previous period in the world's history has the craze for education been so rampant, and, correspondingly, there never has been a time, in spite of the efforts put forth and the means and facilities provided, when we learned less of what is after all really of personal individual importance. In the endeavor to achieve greater accomplishment, through the mediums of commercial and technical education, it is abundantly evident that we are learning much that is superfluous, if not actually dangerous and contributory to future disaster. Too little heed is paid to the fact that it is necessary to unlearn much, and that the process involved is as much and perhaps more educative than the other feature, and far more effective in off-setting trouble and accident.

In spite of the widespread disposition to consider some material creation in mechanical or marine engineering, in transportation or other direction, as the "last word" in its particular sphere, it needs be brought home to us that we are wrong oftentimes, hence the necessity for troubles, accidents, calamities and disasters. No one will deny but that we are getting the latter, and the most impressive part about the thing is that, unconsciously, by our very attitude and action, we are inviting them.

By our acquiescence and resignation in accepting trouble as being "All for the Best," we do well, but unless we take such steps as will not only prevent repetition of some particular happening, and at the same time rid our heads of the thousand silly notions which there find a lodgment and sift well the conglomerate mass which we daily import, there is little else than mockery in the "All for the Best" attitude displayed.

The imparting of knowledge, as education is generally meant to imply, is a process that all from the youngest to the oldest of us find hard to make effective, yet, we believe, hard as that may be, it is harder still to educate ourselves by unlearning or getting rid of what is harmful. All of us have ideas in our heads, however, proud of them we may be, that have no more right there than has a bullet, and until such foreign matter is removed, further imparted education, however valuable will mix badly.

The recent shipping disaster on our Great Lakes was "All for the Best," we say, yet notice the attitude taken by those interested and others who dearly love airing their views in the daily press. Column upon column has been written on the why and wherefore of the tragedy, and most ludicious of all that have appeared are the attempts that have been made to show that as far as the steamship companies are concerned, their property was in no way contributory.

So far as this recent Lakes disaster is concerned, all has been for the best, and it only remains for those concerned, as distinct from those affected by the loss of relatives, to come off their perch, take their medicine like men, get rid of or unlearn what they have formerly considered perfect knowledge of naval architecture and marine engineering, and proceed to work so that such an occurrence or anything similar will be a remote possibility.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

	Mont'l.	Tor'to.
Grey Forge, Pittsburg.	.....	$14 25
Lake Superior, charcoal, Chicago	.....	15 25
Middlesboro, No. 3....	20 00	21 50
Carron, special	24 25	.....
Carron, soft	24.25	.....
Cleveland, No. 3.......	20 00	22 00
Clarence, No. 3........	20 50	21 00
Jarrow	.....	23 50
Glengarnock	......	26 00
Michigan charcoal iron.	25 00	.....
Ferro Nickel pig iron (Soo)	.....	25 00
Victoria, No. 1........	19 40	18 35
Victoria, No. 2X	19 15	18 10
Victoria No. 2 Plain ..	18 90	17 85

BILLETS.

	Per Gross Ton.
Bessemer billets, Pittsburgh ...	$21 00
Open hearth billets, Pittsburgh.	21 00
Forging billets, Pittsburgh.....	26 00
Wire rods, Pittsburgh	26 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto..	2.00
Steel bars, f.o.b., Toronto........	2.05
Common bar iron, f.o.b., Montreal.	2.10
Steel bars, f.o.b., Montreal.......	2.15
Bessemer rails, heavy, at mill.....	1.25
Steel bars, Pittsburgh	1.30
Tank plates, Pittsburgh	1.25
Beams, Pittsburgh	1.30
Angles, Pittsburgh	1.30
Steel hoops, Pittsburgh..........	1.50
F.O.B., Toronto Warehouse.	**Cents.**
Steel bars	2.25
Small shapes	2.35
Warehouse, Freight and Duty to Pay.	**Cents..**
Steel bars	1.80
Structural shapes	1.90
Plates	1.90

Freight, Pittsburgh to Toronto.

18 cents carload; 21 cents less carload.

IRON PIPE FITTINGS.

Canadian malleable, 40 per cent.; cast iron, 65; standard bushings, 70; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 77½; malleable, lipped unions, 65.

NAIL AND SPIKES.

Standard steel wire nails, base..	$2 30	
Cut nails	$2 60	2 65
Miscellaneous wire nails...	75 per cent.	
Pressed spikes, ⅝ diam., 100 lbs.	2 85	

BOILER PLATES.

	Mont'l.	Tor'to.
Plates, ½ in., 100 lbs.....	$2 35	$2 30
Plates, ¼ in., 100 lbs.....	.....	2 20
Heads, per 100 lbs.	2 65	2 55
Tank plates, 3-16 in.......	2 60	2 30
Tubes, per 100 ft., 1 inch	9 50	8 50
" " 1¼ in.	9 50	8 50
" " 1½ "	9 50	9 00
" " 1¾ "	9 50	9 00
" " 2 "	8 75	8 75
" " 2½ "	11 15	11 50
" " 3 "	12 10	12 50
" " 3½ "	14 15	14 50
" " 4 "	18 00	18 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Stove bolts	80 & 7½
Machine bolts, ⅜ and less	65 & 10
Machine bolts, 7-16......	60
Blank bolts	60
Bolt ends	60
Machine screws, iron, brass	35 p.c.
Nuts, square, all sizes....	4¼ per lb off
Nuts, Hexagon, all sizes..	4½ per lb off
Fillister head	25 per cent.
Iron rivets	60, 10 p.c. off
Wood screws, flathead, bright	85, 10, 7½, 10 p.c. off
Wood screws, flathead, Brass	75, 10, 7½, 10 p.c. off
Wood screws, flathead, bronze	70, 10, 7½, 10 p.c. off

Milled Products.

Sq. & Hex. Head Cap Screws	65 & 10%
Sq. & Hex. Head Cap Screws	65 & 10%
Rd. & Fil. Head Cap Screws	45-10-10%
Flat & But. Head Cap Screws	40-10-10%
Finished Nuts up to 1 in...	75%
Finished Nuts over 1 in....	72%
Semi-Fin. Nuts up to 1 in..	72%
Semi-Fin. Nuts over 1 in...	72%
Studs.....................	65%

Discounts, f.o.b., Montreal.

OLD MATERIAL.

Dealers' Buying Prices.	Mont'l.	Tor'to.
Copper, light	$10 00	$11 00
Copper, crucible	12 00	12 25
Copper, uncr'bled, heavy	11 50	11 50
Copper wire, uncr'bled.	11 00	11 50
No. 1 machine compos'n	10 50	10 75
No. 1 comps'n turnings..	9 00	9 00
No. 1 wrought iron.....	9 00	8 00
Heavy melting steel	7 00.	8 50
No. 1 machinery cast iron	13 00	12 00
New brass clippings....	8 50	8 75
No. 1 brass turnings....	7 25	7 50
Heavy lead	3 75	4 00
Tea lead	3 00	3 00
Scrap zinc	3 00	3 50

WROUGHT IRON PIPE.

The following are Toronto jobbers' discounts on pipe in effect from April 21, 1913:

	Buttweld		Lapweld	
Standard	Black	Gal.	Black	Gal.
¼, ⅜ in.	64	49	....	....
½ in	68	58	....	....
¾ to 1½	73	63	....	....
2 in.	73	63	69	59
2½ to 3 in.	73	63	72	62
3½ to 4 in. ..	71½	61½	70½	60½
4½ to 6 in. ..	....	....	71½	61½
7, 8, 10 in. ..	....	....	66	54
X Strong P. E.				
¼, ⅜ in	56½	46½	....	....
½ in.	64	54	....	....
¾ to 1½ in. ..	68	58	....	....
2 to 3 in.	69	59	....	....
2½ to 4 in. ...	....	....	66	56
4½ to 6 in. ..	....	....	64	56
7 to 8 in.	....	....	55	45
XX Strong P. E.				
½ to 2 in.	43	33	....	....
2½ to 4 in. ..	....	....	43	33

PRICES OF WROUGHT IRON PIPE.

Standard.		Extra Strong,		D. Ex. Strong,	
Nom. Diam.	Price. per ft.	Sizes Ins.	Price per ft.	Size Ins.	Price per ft.
⅛in	$ .05½	⅛in	$ .12	½	$. 32
¼in	.06	¼in	.07½	¾	.35
⅜in	.06	⅜in	.07½	1	.37
½in	.08½	½in	.11	1¼	.52½
¾in	.11½	¾in	.15	1½	.65
1 in	.17½	1 in	.22	2	.91
1¼in	.23½	1½in	.30	2½	1.37
1½in	.27½	1½in	.36½	3	1.86
2 in	.37	2 in	.50½	3½	2.30
2½in	.58½	2½in	.77	4	2.76
3 in	.76½	3 in	1.03	4½	3.26
3½in	.92	3½in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4½in	1.27	4½in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.86	...	.....
7 in	2.38	7 in	3.81	...	.....
8 in	2.50	8 in	4.34	...	.....
8 in	2.88	9 in	4.90	...	.....
9 in	3.45	10 in	5.48	...	.....
10 in	3.20	....	.....	...	.....
10 in	3.50	....	.....	....	.....
10 in	4.12	....	.....	...	.....

METALS.

	Mont'l.	Tor'to.
Lake copper, carload....	$16 00	$14 75
Electrolytic copper	15 25	14 75
Casting copper	15 10	14 25
Spelter	5 25	5 25
Tin	40 50	40 00
Lead	5 25	4 85
Antimony	8 50	8 75
Aluminum	21 00	19 50

SHEETS.

	Mont'l.	Tor'to.
Sheets, black, No. 28	$2.85	$2.90
Canada plates, ordinary, 52 sheets	2.90	3.00
Canada plates, all bright	4.00	4.15
Apollo brand, 10¾ oz. (American)	4.30	4.20
Queen's Head, 28 B.W.G.	4.40	4.40
Fleur-de-Lis, 28 B.W.G.	4.20	4.25
Gorbal's Best, No. 28	4.40	4.40
Viking metal, No. 28	4.40	4.40

MISCELLANEOUS.

	Cents
Putty, 100 lb. drums	$2.50
Red dry lead, 5 cwt. casks, per cwt.	6.00
Glue, French medal, per lb.	0.10
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.26
Benzine, per gal.	23½
Pure turpentine	0.60
Linseed oil, raw	0.60
Linseed oil, boiled	0.63
Plaster of Paris, per bbl.	2.10
Plumbers' Oakum, per 100 lbs.	3.25
Pure Manila rope	0.17

COKE AND COAL.

Solvay Foundry Coke	$5.95
Connellsville Foundry Coke	5.80
Yough, Steam Lump Coal	3.88
Penn. Steam Lump Coal	3.68
Best Slack	2.99

All net ton f.o.b. Toronto.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents.

Montreal, December 1, 1913.—There is little change in general business conditions since last week; however, collections are improving locally and the feeling that each week brings the end of the depression a little nearer serves to keep up one's spirits. The greatest crop on record has been safely harvested and the proceeds are just beginning to flow a little freely. Business, generally, is still restricted to transactions in immediate needs, a condition of affairs that will no doubt continue until a recovery of the money market takes place. No material release of funds need probably be looked for until next spring and in some lines of business conditions may become worse before then. However, a business depression usually provides its own cure, since by restricting operations it decreases the demand for funds.

The local machinery market continues very dull, a few scattered orders being all that have materialized during the past few weeks. Dealers are all busy on tenders for the equipment wanted by the Grand Trunk Pacific at Prince Rupert, B.C. These have to be in by December 15. It is to be hoped that Canadian houses will secure the bulk of this important order, though there seems to be an opinion prevalent that most of it will be placed in New York.

Most foundries report plenty of orders on hand for immediate delivery, but not a great deal of work ahead. It is stated that the pig iron stocks of most consumers are low, but there is still a strong disposition to buy cautiously, there being a very general feeling that prices may shortly drop. Merchants are inclined to think that a slight lowering of prices would stimulate a really brisk buying demand and that prices would then advance again. The furnaces at Hamilton, Deseronto, and Port Colborne are all busy, the last named being said to have orders on hand for four months ahead. The Dominion Iron and Steel Co. is selling a little pig, but uses the bulk of its product is for its own use.

Copper remains firm at last week's figures, its rapid fall having apparently been stemmed for the present. Lead is considerably easier in view of the larger supplies now in sight.

Toronto, Ont., Dec. 2.—While makers of steel are inclined to view the business situation pessimistically, there is a little brightness on the horizon. With all the rumors circulating about steel plants laying off men and some closing down, it is cheering to learn that the Swansea plant of the Steel Company of Canada, which has been working four days a week, will shortly go back to full time. This plant manufactures bolts, nuts and screws, and it is a bigger demand for bolts that has improved the prospects.

There is another fact that gives cause for optimism. In Western Ontario, manufacturers are holding out for lower steel prices, but their stocks are so low, that they will soon be compelled to buy. Like the man trying to sell his shares when the stock market is the most favorable, he may not hit it at the right place. He may find that he has waited too long, and that the price of steel has advanced. There was a report in the city this week that the price of steel bars in Pittsburgh had advanced 5 cents a cwt., but this could not be corroborated locally.

Stronger Market.

The steel market is decidedly stronger this week. Efforts are being made to hold it up, and the feeling all round is that the price has gone as low as it can. Buyers demand a lower quotation, but usually give the price asked. Prices have remained firm here for the past three weeks, but there is a likelihood of a further drop where the steel companies are desirous of keeping their men.

A Montreal newspaper published a report last week to the effect that the Steel Company of Canada was contemplating new financing. This was denied by a prominent Hamilton official, who stated that the company had plenty of money to keep them going. The United States Steel Co. are reported, on excellent authority, to have prepared plans for their Sandwich plant, and intend to go ahead and build.

Wire and Nails.

The wire and nail business is picking up, although prices are poor. Orders are coming in faster. The price of nails is 2.25 cents, against 2.50 cents formerly. Wire is 2.20 cents base, and there is lots of business at that price.

Tool steel for drills on the new Welland Canal will probably not be required until next summer, as it is hardly likely that contractors will be operating their rock drills by the spring. Conditions on different sections vary, however.

Machine Tools.

Big shops, like the implement makers, electrical and locomotive firms, are badly in need of machine tools, but apparently are holding off until things improve. The machine tool agents feel the loss of this business keenly. The railways are all sending in good inquiries, and small machine shops are buying tools, but for which, the machine tool business would certainly be slack. A big locomotive works report that they are not buying tools until the first of the year.

Inquiries this week include one from the Michigan Central Railway for their St. Thomas shops. They require two shapers, 16 in. and 24 in., an 18 in. lathe, four 16 in. lathes, a 30 in. lathe, a 600-ton hydraulic wheel press, a 100-ton ditto, motor-driven grindstone frame, 25 or 30-ton forcing press, high speed hack saw, 3 ft. and 4 ft. radial drills, motor-driven emery grinders, and other tools. Tenders are to be in early. B. Aikens, purchasing agent, Detroit.

N.T.R. Inquiries.

The Transcontinental Railway have invited tenders for the following: tap lathe, drilling machine, shaper, pipe threading machine, bolt cutter, motor-driven grindstone frame, motor-driven grinding machine, and an up draft forge, all for Grant, Ont.

The Kelsey Wheel Co., of Windsor, Ont., have not yet purchased their machine tools. The Sarnia Bridge Co. are buying a large crane. The Ontario Steel Products Co., Gananoque, should be replacing some of the tools damaged in the recent fire.

The Russell Motor Co., Toronto, have reached a point where they must go ahead with the manufacture of 1914 season cars, and propose to take on hands at the rate of fifty at a time, until by the spring their staff is increased by 200. As they recently laid off a lot of men, these will no doubt be taken on again. They will not be buying new equipment.

Metals.

People who have scrap seem more inclined to sell now, having got the impression that the market will not improve at the moment. Big dealers are buying all they can lay hands on at the present price. There are, however, few sales of metal, and prices remain the same practically. Orders for scrap iron and steel are not being placed by big steel companies.

St. John, N.B., Nov. 29, 1913.—The Atlantic Oilfields, Ltd., has been incorporated at Fredericton with a capital of $3,000,000, with its head office there, for the purpose of developing the oil-shale deposits of New Brunswick. The incorporators have the right to locate, quarry, mine or bore for oil, oil-shale, albertite, and other substances, and to operate wherever necessary in this connection. Old Country money is behind the venture. The incorporators are J. Fraser Winslow, J. B. Gregory, A. E. Rush, A. L. Finnamore, all of Fredericton.

Secretary Hoag, of the Board of Trade, announced this week that a new brick plant would probably be established at St. John early next spring. The price of bricks here this summer has been unusually high, and the local concern engaged in their manufacture has been unable to cope with the demand, so much so, in fact, that contracts for a millon or more were given to the Nova Scotia Clay Co. at Annapolis, in order to meet the requirements of the Atlantic Sugar Refinery Co. here. It is now said definitely that local people intend erecting a brick manufacturing plant here, on a site already taken, in the spring.

A Company, composed of F. Cooper, F. B. Edgecombe, B. Adams, and K. Kein, of Fredericton; H. J. Gordon and W. H. McWhinney, of Black River, has been formed to develop valuable copper deposits at Black River, N.B. Copper mining on an extensive scale will be carried on by them. From various places reports have been received of the analysis of the ore deposits, and they show $15 to the ton of copper, and $4 to the ton gold. The discovery of the deposits was made by A. C. Gordon, an experienced miner of Montana, on the property of R. Moore.

The new shoe factory at St. Stephen is practically completed, and Messrs. Clarke, managers of the plant, have strong hopes of a number of machines being in operation by the first of the year. This new plant means much to the industrial life of St. Stephen.

The Rothwell Coal Co. have installed a plant for mining by machinery in their mine at Minto, and an expert from the manufacturers is to go there to test the operation of it. The new machines will add greatly to the output, as each machine takes the place of six men, who will all be employed on other work in the mine.

Trade Gossip

The Goodyear Tire & Rubber Co. of Canada, Ltd., has just announced several important changes in the personnel of those at the head of its sales organization. P. D. Saylor, vice-president and sales manager of the Canadian Company, has been made president and managing

P. D. SAYLOR.

director of the Goodyear Tire & Rubber Co. (Great Britain) Ltd., with headquarters in London, Eng. R. P. D. Graham, secretary and manager of the Automobile Tire Department, has been elevated to the position of sales director, succeeding Mr. Saylor. H. C. Lower, for some years assistant manager of the automobile tire department of the Goodyear Tire & Rubber Co., of Akron, Ohio, succeeds Mr. Graham as manager of the tire department. The announcement of Mr. Saylor's transfer across the Atlantic has been received with regret by Canadian automobile and tire men generally, in whose esteem he won a high place. The record he has made, however, justifies their belief in his ability to handle the vast problems which now confront him. As head of the Goodyear Tire and Rubber Co. (Great Britain) Ltd., he will have direct charge of the extension of Goodyear interests throughout the world, outside North and South America. Upon laying down the reins of office here, Mr. Saylor was presented with a magnificent diamond ring by the members of the Goodyear sales force. He carries with him into his new field of labor the sincere good wishes of the whole Goodyear organization as well as of a host of personal friends.

The Jackson Manufacturing Co., Clinton, Ont., have formed a joint stock company with an authorized capital of $150,000. The officers of the company are W. Jackson, president; T. Jackson jr., vice president, treasurer, Miss Josie Witts and secretary, Miss Ida Wilkin. The company have made the head office at Clinton, and branches of their factory, are at Goderich, Exeter and Zurich.

The Canadian H. W. Johns-Manville Co., Ltd., have removed their Toronto branch to more spacious quarters at 19 Front Street, East. This new store and warehouse has a floor area of approximately 35,000 sq. feet, and is situated in the heart of the wholesale district. They will carry a larger stock, and have ample space for the display of their J-M Asbestos Roofings, packings, pipe coverings, building materials, electrical and railroad supplies, automobile and plumbing specialties, etc. The entire building will be lighted by their Frink and J-M Linolite system of lighting, and one room will be used for exhibiting these systems.

The Canadian Fairbanks Morse Co. have just completed a large and modern warehouse and office building, at Montreal, situated on St. Antoine Street, not far from the C.P.R. offices. This building is of concrete construction throughout, and thoroughly up to date in every respect. Instead of the usual sample room floor and offices entirely separate, it is the company's intention to have two main sample room floors with offices combined, so that customers can see the goods they are intending to purchase at the same time as they are discussing them with the various departments. There will be a demonstrating room in the basement, so arranged that gasoline engines, motors, etc., can be seen in operation from the street. Among other novel features will be a customers' waiting room, and an internal water filtration plant.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Engineering

Castor, Alta.—L. G. Humbert, of Consort, is contemplating the erection here of an iron works.

Victoria, B.C.—The Canadian Steel Studding & Mfg. Co. has been incorporated here.

Hamilton, Ont.—The Osler File Co., who do file recutting and rasping, will double their capacity in the near future.

New Glasgow, N.S.—The Eastern Car Co. is running its plant at full capacity on an order for 2,000 cars secured a year ago.

Dundas, Ont. — The John Bertram & Sons Co., Ltd., will extend their pattern storage building. Other local firms are contemplating extensions.

Edmonton, Alta.—Fire in the McKinney block did $200,000 damage November 25, of which $10,000 was sustained by the Otis-Fensom Elevator Co.

St. John's, Nfld.—The Reid-Newfoundland Co. are very busy just now. Several competent Canadian engineers and machinists have recently been taken on.

Vancouver, B.C.—Letson & Burpee, Ltd., die makers, machinists, etc., 142 Alexander Street, are not yet prepared should be in the market for moulding machines, etc.

Montreal, Que.—Work that should have been done at the Port Huron, Mich., shops of the G.T.R., which were burned last week, will be performed in Canadian shops.

Toronto, Ont.—The Canada Wire & Cable Co. have built a new plant at Leaside, and have bought four Robb-Mumford boilers of 60 in. diam. x 18 ft. long, 130 h.p., 125 lbs. pressure.

New Westminster, B.C.—The council have extended the time limit for the completion of the plant of the Heaps Engineering Co., Ltd., by a year. It should have been completed December 1.

MACHINERY EQUIPMENT, TORONTO TECHNICAL SCHOOL

Machine tools, woodworking machinery, and foundry equipment costing between $20,000 and $30,000 will be required by Toronto Technical School early in the new year. The new school on Harbord Street, is nearing completion, and when contracts for the new equipment have been let, delivery must be prompt. The equipment for the machine shop will consist of drills, grinders, one or two planers, two shapers, three or four milling machines, engine lathes of various makes and styles, and smaller machine tools. The woodworking tools will include a jointer, circular and band saws, surface planer, sandpapering machine, universal trimmer, etc. A blower and motor will probably be required for the forge as well as the regular equipment. In the foundry there will be a small cupola, brass furnaces, a sand blasting arrangement, air hoist and hand traveling crane, and probably two moulding machines. Besides these, equipment will be required for an electrical construction shop, for a plumbing shop, and equipment for making brick and cement work. Many of the machine tools must be self-contained, motor-driven. Tenders will be called for by J. W. McBean, who has charge of the lay-out of the various departments, and who will visit several large machine shops in Ontario before deciding on the type of equipment to be purchased.

Tillsonburg, Ont. — The Tillsonburg Car Co. have secured sufficient orders to assure the operation of the plant all winter.

Toronto, Ont.—R. J. Selby, 484 St. Clarens Avenue, has started to manufacture wood and metal patterns and models.

Port Arthur, Ont.—The Miles Car and Manufacturing Co., Cleveland, Ohio, may establish a plant at either Port Arthur or Fort William.

Vancouver, B.C. — In a fire which broke out on Nov. 28, the Canadian Westinghouse Co., suffered damage to the extent of $75,000.

Halifax, N.S.—The Nova Scotia Car Works, Ltd. is overhauling its plant, and rebuilding the foundry which was destroyed by fire last summer.

to go on with the erection of a new plant.

St. John, N.B.—Garnet Wilson, 50 Princess Street, has been appointed architect for a nail and wire fence factory for a syndicate. Plans are being made.

Orillia, Ont.—An English motor car firm, who expect to make 2,000 cars next year, are negotiating with the Council for a site opposite the Tudhope-Anderson factory.

Galt, Ont.—The Galt Garage and Repair Co. will erect a new shop, single storey, 50 x 75 ft. George McGavin, late of Canadian Motors, Ltd., will be manager.

Hamilton, Ont.—The Brown, Boggs Co., Ltd., have built a new foundry, and converted their old one into a machine shop extension. Early next year they

Montreal, Que.—The plant of the Canadian Rolling Mills, which is connected with the Canadian Tube and Iron Co., is nearing completion, and should be ready for operation by February.

London, Ont.—The Grobb Co., capitalized at $100,000, will erect an addition to the London Foundry for the manufacture of forgings and gas producers. They ask the city to loan them $25,000.

Welland, Ont. — The Mentholateum Co., Ltd., have finished their $22,000 plant. The Mesta Manufacturing Co., of Pittsburgh, will have some of their product for Canadian trade made in this plant.

Sydney, N.S.—The Dominion Coal Co. will shortly commence operating their new bank head screening plant and trestle which has just been completed by the Sydney Foundry and Machine Works, Ltd., at No. 16 colliery, New Waterford.

Victoria, B.C.—The Esquimault and Nanaimo Railway Co. will move their machine shops from Wellington to Victoria, B.C., early next year. They will employ 50 men. H. E. Beasley, general superintendent.

Brantford, Ont.—The plant of the Farmers' Binder Twine Co. has been sold to a syndicate composed of A. L. McPherson and others. It will be occupied by the Brantford Scale Co. or the Brantford Grey Iron Co.

Vegreville, Alta.—Garneau Bros. & Inkster are installing machinery for a machine and general repair shop in connection with the garage on the north side. The shop will be in readiness to handle work about December 1.

Ottawa, Ont.—The Ross Rifle Co., Que, is stated to be planning the erection of a factory near the Connaught rifle range, Ottawa, This Company manufactures much of the ammunition and rifles used by Canadian troops.

Hamilton, Ont.—The Chadwick Brass Co. extension has been delayed until next spring. It will be three storeys, fireproof construction, and include machine shops, plating shops, etc. The Company make brass gas and electric fittings. W. M. Currie, vice-president.

Galt, Ont.—Notice was given the employes of the Machinery Co. (Ballantyne's foundry), that the shop would close down for an indefinite period at noon, last Saturday. The apprentices will be supplied with work elsewhere to fill out their term.

Windsor, Ont.—Cass and Lloyd, formerly of Vancouver, are negotiating with a view to purchasing a portion of the old malleable iron foundry, on Walker road. If successful, it is their intention to make necessary alterations and rent space to manufacturers.

Vancouver, B.C.—The Morrison Nail & Wire Co. has obtained a new site on Lulu Island on the North Arm of the Fraser, and contemplate removing its Vancouver and Westminster works to this location. The site is of 16 acres, and has a waterfrontage of 600 feet.

Sault Ste. Marie.—The Algoma Steel Corporation is completing plans for two new open hearth furnaces. They will be ready for operation next summer. This will add 300 tons a day to the present 600 tons open hearth capacity. The work will cost $250,000. President, J. Frater Taylor.

Toronto, Ont.—A building permit was issued by the city architect's department, November 27, to the United Typewriter Co., for the erection of a six-storey brick warehouse on the east side of Victoria, near Queen Street. The new building will cost $55,000.

Stratford, Ont.—The G.T.R. will make extensions to its Stratford property. Plans are under way for the extension of the round house, adding about twenty more stalls, which will double its capacity. It is not expected that this work will be commenced until next spring.

Goderich, Ont.—A by-law granting the American Road Machine Co. fixed assessment of $10,000 and guaranteed bonds of $40,000 was passed last Saturday. The new plant will be constructed of concrete and steel, 400 feet by 70 by 30, costing over $67,000, with machinery worth $30,000.

Fredericton, N.B.—The following firms have been licensed to transact business in New Brunswick during 1914:—McLaughlin Carriage Co., Ottawa; the Petrie Mfg. Co., Hamilton, Ont.; Canadian Fairbanks-Morse Co., Montreal; Siemens Co., of Canada, Ltd., Montreal; John Taylor & Co., Ltd., Toronto; Sharples Separator Co., of West Chester, Me., and the Page Wire Fence Co., of Walkerville.

Hamilton, Ont.—The plant of the Canada Steel Co., which was burned in August, is practically rebuilt. The old rolling mill is in operation, and new mills are being installed for manufacturing channels, small T bars, angles, rounds and squares. The motor for running this has been ordered. The machine shop has been newly equipped. More tools will be required later, including 24 in. shaper, planer, grinders, etc.

Westmount, Que.— Westmount Motors, Ltd., has been incorporated at Ottawa, capital $50,000, to manufacture and repair automobiles, motors, boats, etc., and to carry on the business of machinists, blacksmiths and foundrymen. Incorporators: William K. Mc Keown, Leopold Choquette, advocates; Edward A. Barnard, James R. Law and George E. Chart, accountants, Montreal, Que.

Montreal, Que.—The White Smelting and Refining Works, Ltd., has been incorporated in the Province of Quebec to treat ores and to carry on a general foundry and machine shop business at Montreal, with a capital of $20,000. They will acquire and pay in cash for the business owned by A. Rudolph Vallance and Emile Schwartz. Among those interested are, J. Washington Richards and J. A. T. Richards, Montreal.

Levis, Que.—The National Drop Forge Co., Ltd., has been incorporated at Ottawa, capital $49,000, to carry on in all its branches the business of drop forging in general and manufacturing saws or any other business of a like nature. Incorporators: John B. Dorais, manager, Eusebe Belleau and Noel Belleau, lawyers, of Levis, Que., Elzear Baillargeon, lawyer, and Ulderic Saindon, accountant of the City of Quebec.

Gananoque, Ont.—The Ontario Steel Products Co., Ltd., whose spring and axle plant was burned down last summer, are building a larger plant of brick, stone and reinforced concrete, with steel sash, and steel trusses covered with Johns-Manville patent roofing. It is equipped throughout with Chapman ball bearings, and will be in operation Dec. 15. The old equipment is being cleaned up and re-built, but some will be found useless. This will be replaced by new equipment in due course.

Electrical

Ayr, Ont.—The Hydro-Electric will supply this town with power, and probably New Dundee and Roseville as well.

Perth, Ont.—James & Reid will instal an electric lighting plant in their large hardware store and manufacturing plant.

South Vancouver, B.C.—The town will instal fifty fire alarm boxes at a cost of $13,000 and 25 police telephone boxes at at cost of $10,000.

Fort William, Ont.—The Maynard Electric Co. of Winnipeg, is planning the erection of a large warehouse here, where it does a large business.

Forrest, Ont.—The by-law to issue debentures for $7,500 to complete the electric light plant has passed committee stage.

Neepawa, Man.—A by-law authorizing the expenditure of $18,000 on improvements to the electric light plant will shortly be submitted to the ratepayers.

Sandwich, Ont.—The ratepayers will vote in January on two by-laws, one to take Hydro-Electric power, and the other to provide money for installing the system.

Courtright, Ont.— The Western Salt Co. proposes to light the streets by electricity. J W. James offers to instal a gasoline engine and generator if given franchise. There are other offers.

Ottawa, Ont.—Mayor Ellis and the Ottawa Electric Commission, with Hon. Adam Beck, went over the details of a new contract with the Ottawa and Hull Electric Co. last Thursday. The increased power consumption has made a new agreement necessary.

St. Thomas, Ont.—The street car system was put out of business last Thursday when the rotary converter broke down. City Electrician Roberts recommends the city to purchase another at a cost of $2,300.

Hamilton, Ont.—The Hydro-Electric Commission have decided to supply power to the Township of Barton. Hamilton has been asked to construct the plant and supply the power, but the commission may do it.

Dryden, Ont.—The bondholders of the Dryden Timber & Power Co. have sanctioned an issue of notes for installing additional machinery. About $100,000 will be spent. The mills will be closed down for two or three months.

Brantford, Ont.—The Western Counties Electric Co. have engaged experts to secure long-time contracts with manufacturers and other big users of power, thus fighting the Hydro-Electric Commission, who will shortly enter the city.

Vancouver, B.C.—A fire broke out in the warerooms of Hetson & Gillis, electrical engineers on November 28. The losses total $155,000, as follows:—Canadian Westinghouse, $75,000; McGowan & Co., $20,000; Montelus Piano Co., $20,000; W. J. Haddock, $25,000; Hetson & Gillis, $15,000.

Orillia, Ont. — The Hydro-Electric Commission of Ontario have made an offer to supply power to the town. The commission is prepared to pay the town $100,000 for its power plant, etc. In the meantime the Water, Power and Light Commission will not go ahead with the erection of a power plant at Swift Rapids.

Peterborough, Ont.—The Government has cancelled the lease given by the late Government to Mr. Culverwell and others of the Burleigh power. The lease was given originally for one dollar per year for fifty years and entitled the lessee to all the surplus water which was to be handled by the Government in the lessee's interests. This power will probably be developed for the people.

General Industrial

Calgary, Alta.—Snow & Baker, of Whitefield, N.H., will erect an overall factory here.

Calgary, Alta.—The Western Milling Company will build a 1,200 bbl. plant to cost $200,000, to be in operation by July next.

St. Mary's, Ont.—G. Garter, Sons & Co., Ltd., have completed plans to build a 700-bbl. flour mill.

Lethbridge, Alta. — The Columbia Macaroni Co. have installed their machinery and will start operation early this month.

Caledonia, Ont.—A company in which W. W. Huchinson is interested will build a gypsum mill, plans for which are being made.

Carmen, Man.—The Canadian Tile and Fire Proofing Co. will increase their plant during the winter. New kilns will be added.

St. Catharines, Ont.—Carpenter work has begun on the new plant of the Dominion Foods Co. This will be a two-storey building.

Cobourg, Ont.—The Cobourg Drying Co. have purchased a building in which they will instal machinery for a drying plant. J. E. Hall, Supt.

Arnprior, Ont.—A manufacturing concern will erect a factory here, and the town will lend them $10,000. A large exporter will erect a grist mill here.

Lucan, Ont.—The Lucan Evaporator, owned and operated by J. F. Langdon, of Brighton, Ont., with over $4,000 worth of stock, was totally destroyed by fire, Nov. 27.

Waterloo, Ont.—Snyder Bros. Upholstering Co., are extending their plant 80 x 100 feet, two storeys, at a cost of $15,000. Ellert Bros., are contractors for the mason work.

Deloraine, Man.—A. B. Harris closed down his shoe factory here last week, and is understood to have sold the plant to a Brandon firm who will establish a branch at Regina.

Quebec, Que.—The city council have granted exemption of taxes for ten years to G. A. Vandry, who will commence a biscuit factory here. The machinery has been purchased in France.

Perth, Ont.—J. A. Stewart and W. E. Danner have purchased the shares of Koch and Campbell, Philadelphia, in the Henry K. Wampole Co., and will make extensions to the plant.

Vancouver, B.C.—The Royal Crown Soaps, Ltd., will build a new plant on Burrard Inlet in North Burnaby, costing $250,000. Seven acres have been purchased. F. T. Schooley, local manager.

Leamington, Ont.—The H. J. Heinz Co., makers of pickles, have commenced the erection of a large addition to their plant here. The brick structure will be 80x200 feet, three stories high. The company also intends making alterations in the main building.

Brampton, Ont.—A. Dick & Son, Alton, contemplate starting a knitting factory. Six machines will be installed at once, the number to be added to. The managers think there is room for expansion in the knitting business and will discontinue the manufacture of sleighs, but continue to make wagons.

Wood-Working

Toronto, Ont.—Osler Wade, assignee, will receive tenders for the assets of The T. Heal Woodworking Co., consisting of machinery, stock in trade, etc.

Spuzzom, B.C.—A sawmill, etc., is contemplated by J. C. Shields, Winch Bldg., Vancouver. Besides a sawmill, a flume will be built from the limit to the C. P. R. and a planing mill where the flume meets the C.P.R

New Westminster, B.C.—The plant of the Dominion Match Co. will probably be started at an early date. At a meeting of the shareholders on Saturday, November 29, arrangements were made to put the company on a satisfactory basis.

New Incorporations

Beach Furniture, Ltd., incorporated at Toronto, capital $99,900, to manufacture furniture at Cornwall, Ont. Incorporators: Robert H. Perry, James Freeman, etc., Cornwall.

The City Garage Co., of North Bay, Ltd., incorporated at Toronto, capital $40,000, to operate at North Bay, Ont. Incorporators: David J. Elliott, Daniel E. Shields, etc., North Bay.

Trent Valley Canners, Ltd., incorporated at Toronto, capital $1,000,000, to carry on business as canners, at Trenton, Ont.; Incorporators: Bert H. L. Symmes, George W. Morley, etc., Toronto.

Canadian Contracting Co., Ltd., incorporated at Ottawa, capital $1,000,000, to carry on the business of contracting at Ottawa. Incorporators: Eusebe Belleau, Noel Belleau, etc., Quebec, Que.

The Century Pressed Brick & Tile Co., Ltd., incorporated at Toronto, capital $250,000, to manufacture brick, etc., at Georgetown, Ont. Incorporators: John W. Ramshaw, John R. Peacock, etc., Milton, Ont.

Inland Pulp & Paper Co., Ltd., incorporated at Toronto, capital $200,000, to take over the business now carried on at Thorold, Ont., under the name of Colonial Wood Products, Ltd. Incorporators: Gabriel H. Levy, Archibald H. Gibson, etc., Hamilton.

Electrical Properties, Ltd., incorporated at Ottawa, capital $1,000,000, to organize or to assist in the organization of any corporation, company, etc., at Montreal. Incorporators: Charles A. Pope, Gregor Barclay, etc., Montreal.

McNaughton-McKay Electric Co., Ltd., incorporated at Toronto, capital $40,000, to manufacture electrical supplies and materials of every description, at Windsor, Ont. Incorporators; Arch. McKay, John R. McNaughton, etc., Detroit, Mich.

Lachine Rapids Power Co., Ltd., incorporated at Ottawa, capital $500,000, to carry on the business of an electric light, heat and power company in all its branches, at Montreal. Incorporators: William K. McKeown, Leopold Choquette, etc., Montreal.

Alberta Hydro-Electric Co., Ltd., incorporated at Ottawa, capital $1,000,000, to use and apply water and water power for any of the purposes for which same may be used, at Calgary, Alta. Incorporators: Frederick Stanley, Albright Smith, etc., Calgary.

Alberta Hydro-Electric Co., Ltd., incorporated at Ottawa, capital $1,000,000, to use and supply water and water power for any of the purposes for which the same may be used, at Calgary, Alta. Incorporators: Frederick S. Albright, Arthur L. Smith, etc., Calgary.

Ontario Furniture Co., incorporated at Toronto, capital $50,000, to take over the assets, including the goodwill of the business now being carried on by Keene Bros., at London, Ont. Incorporators: Charles E. Keene, Arthur H. Keene, etc., London.

Electrical Properties, Ltd., incorporated at Ottawa, capital $1,000,000, to organize or otherwise deal with electricity for any purpose for which same may be used, or the manufacturing or dealing with electrical machinery or apparatus of any kind, at Montreal. Incorporators: Charles A. Pope, Andrew A. Wanklyn, etc., Montreal.

Tenders

Vancouver, B.C.—Tenders for the construction of the new immigration shed and office buildings are to be called immediately. The price is estimated at $350,000.

Toronto, Ont.—Tenders for pumps at the high level pumping station, and for the construction of the Gerrard Street bridge have been received, and referred to Works Commissioner Harris.

Toronto, Ont.—Tenders will be received up to January 20, for the installation of a complete mechanical filtration plant, boilers, steam turbo, generator plant, and all appurtenances at Toronto Island.

Bowness, Alta.—The following electrical machinery is required by the Bowness Improvement Co.: One 200 kw. traction motor; one 4-panel switchboard; one 250 kv.a. generator; one gas engine. Tenders will be received until December 31st.

Toronto, Ont.—Tenders will be received, addressed to the Chairman of the Board of Control, up to December 16, for an overhead hand-operated travelling crane, having a working load of 40,000 pounds, for Main Pumping Station, foot of John Street. Chairman Board of Control.

Neepawa, Man.—Tenders were recently opened for machinery for the electric light plant. The placing of orders for two boilers and one engine was left in the hands of W. E. Skinner, to decide between Messrs. Goldie, McCulloch Co., Galt, and E. Leonard & Sons. The order for a generator went to the Canadian General Electric Co. at $2,742.

Refrigeration

Berlin, Ont.—The local medical officer of health strongly urges the city to erect an abattoir here.

Lethbridge, Alta. — Delaney's, Ltd., have bought a site on which they will erect a packing plant.

Hamilton, Ont.—The question of establishing a civic abattoir will come before the council next year.

Moose Jaw, Sask.—The damage to Gordon, Ironside and Fares' abattoir by fire Sunday, November 23, was $145,000.

Moose Jaw, Sask.—Fire on November 22 did much damage to the cold storage plant at Gordon, Ironside & Fair's abattoir.

Burlington, Ont. — The Burlington Skating Rink Co. have applied for a charter, with a capital of $10,000. The Preston Metal Sheeting and Roofing Co. will erect the building. Edward Dickenson and John C. Smith are interested.

New Westminster, B. C.—The Columbia Cold Storage Co. have refused offers made by the city, and will move their plant later to Prince Rupert. They have also awarded a contract for a plant at Steveston, B.C., to the B.C. Granetoid Co. for about $100,000.

New Glasgow, N.S.—John T. Nickerson, Liverpool, N.S., will erect a cold storage warehouse some time early in the new year.

Contracts Awarded

Ottawa, Ont.—The waterworks committee have accepted the tender of the McDougall Co., Ottawa, for fifty fire hydrants. The tender was $2,059.50.

Ottawa, Ont.—The Government has awarded the contract for the ocean section of the terminal scheme to Foley Brothers, Welch, Stewart and Fauquier for $5,208,743.

Victoria, B.C.—A contract for the construction of a dump scow with capacity of 260 cubic yards, has been awarded to the Wallace Shipyards, Ltd., for $8,475.

Halifax, N.S.—The Standard Construction Co., of Halifax, have been awarded the contract for building the new Lennox Passage bridge in Richmond County, Cape Breton.

Nelson, N.B.—K. A. Morrison, Ottawa, Ont., has been awarded a contract for work on the division of line between Nelson and Derby Junction, 2¾ miles, for the Intercolonial Railway.

Ottawa, Ont.—A contract was let last week to the Hall Switch and Signal Co. for the installation of a telephone train-despatching line between Moncton and St. John, on the I.C.R., to cost $10,371.

Waterloo, Ont.—The contract for supplying a turbine pump and electric motor, with capacity of 400,000 gallons, has been given to the Canadian Allis Chalmers Co., Ltd., Toronto, by the Water and Light Commission.

Ottawa, Ont.—The Canadian Bridge Company has been awarded contracts for four bridges on the Eastern part of the Transcontinental. The price is $90,469. The Maritime Dredging Co. will construct a breakwater at Mace Bay, N.B., for $11,823.

Toronto, Ont.—The contract has been awarded by the Board of Control for the supply, and installation of an 84-inch steel conduit to be run across the island from the pure water reservoir to the south tunnel shaft, to the firm, Roger Miller & Sons. The contract price is $540,000.

Victoria, B.C.—The contract for the construction of the reinforced concrete flow line for the Sooke Lake water works system has been let to the Pacific Lock Joint Pipe Co. The company's bid was $329,760 for a forty-inch pipe line, but the size of the pipe has since been increased to forty-two inches.

Municipal

Sudbury, Ont.—The town will purchase a road roller, costing $3,235.

Westmount, Que.—The city will build a reservoir on Mount Royal in connection with its water works system.

Brandon, Man.—The city has an option on 538 acres of coal land near Bienfait with a view to municipal operation.

The Pas, Man.—The ratepayers will vote on a by-law for spending $130,000 on waterworks, sewers and electric lighting.

Sault Ste. Marie, Ont.—The city has engaged Willis Chipman, Toronto, to draft a scheme for a new sewerage system.

Edmonton, Alta.—Cost Engineer Bowness, superintendent of the Bureau of Efficiency, has prepared figures of the cost of a municipal incinerator.

Toronto, Ont.—Tenders will be received up to January 20, by the Board of Control, for a filtration plant with a capacity of 60,000,000 gallons a day. The estimated cost is $1,000,000.

Toronto, Ont.—By-laws authorizing the issuing of debentures to the amount of $963,890 for pavements between street railway tracks and $745,675 for water mains for revenue purposes were passed recently.

St. Thomas, Ont. — J. T. Lynn, Detroit gas expert, has advised the city to contract for natural gas. New mains costing $20,000 will be required. If the artificial gas plant is continued, $60,000 must be spent.

Marine

Sarnia, Ont.—It is believed that Sarnia and Port Huron will join to purchase a fire tug.

Sarnia, Ont.—The new steamer Noronic, of the Northern Navigation Co. arrived in Sarnia on Saturday to be fitted out during the winter.

Kingston, Ont. — The boilers of the steamer Geronia, are being removed and new water-tube boilers installed. She belongs to the R. & O.

Fisheries Cruiser "Malaspina."—The fishery protection cruiser Malaspina, the first of the two vessels being built for the Dominion Government, dropped anchor in Esquimault harbor on the morning of November 21, seventy-five days out from Greenock, Scotland. She made excellent time on her 15,000 mile voyage, via the Straits of Magellan, in spite of very rough weather off Rio de Janeiro, when the firemen had to work in water hip deep in the engine room.

Fort William, Ont.—The passenger steamer Athabasca will enter the dry-dock for the winter. She will be thoroughly overhauled before the opening of navigation next spring.

Ottawa, Ont.—Ulric Valiquette, supervising engineer of the Public Works Department, left November 27 for Esquimalt, B.C., to choose a location for the new dry-dock. It will be almost a complete duplicate of the dock now being constructed at Quebec.

Railways—Bridges

St. John, N.B.—The St. John Railway Co. recently installed a large new steam engine in their power house.

St. Mary's, Ont. — A scheme for a hydro radial line from London to Stratford through St. Mary's is on foot.

Vancouver, B.C.—The Dominion Government has promised a subsidy of $350,000 towards the bridge over the Second Narrows.

Ottawa, Ont.—The franchise of the Ottawa Electric Railway through Hintonburg, expires the year after next. The city may build the line.

Toronto, Ont.—The Government will start work this winter on an extension of the Temiskaming & Northern Ontario Railway to Gowganda.

Victoria, B.C.—Plans for the new Provincial Government bridge to be thrown across the Pit river at Dewdney Trunk road where a ferry now does service, are practically complete.

St. Thomas, Ont.—To place the local street railway in shape, $25,000 will be spent on additional lines. City Engineer Ferguson is making a report.

Owen Sound, Ont.—The Grand Trunk Railway Co. has made an offer to the Simcoe, Grey and Bruce Railway Co., relative to the taking over of the Meaford road, if built by the S. G. & B.

Victoria, B.C.—The Legislative Assembly will meet early in January for the purpose of dealing with three important proposals: Providing $25,000,000 as a subsidy for Mackenzie and Mann, in support of their railway construction work in this Province, passing a vote of $15,000,000 for Foley, Welch and Stewart, the railway contractors, and $15,000,000 for general purposes.

Ottawa, Ont.—Upwards of $12,000,000 will have been spent upon the Hudson Bay Railway scheme by the end of 1915. So far, including office expenses nearly $4,400,000 has been spent, and the three contracts for the railway proper aggregate $8,577,000.

Vancouver, B.C.—Steel structural operations have been started on the overhead bridge to be built by the C.P.R. from the foot of Burrard Street to the waterfront in connection with the other units of its big terminal improvement scheme. Material is being assembled and work is well under way with piers, the foundations for which have been ready some time.

Trade Gossip

New Supply Warehouse.—The Dominion Foundry Supply Co. have recently moved from 20 Pearl St., Toronto, to more commodious office and warehou[se] premises at corner Spadina Ave. [and] Richmond street. This move be

NEW WAREHOUSE, DOMINION FOU

necessary owing to their increased trade and the larger warehouse will permit of an increased and more complete stock being carried, thus assuring prompt filling of all orders.

The American Laundry Machinery Co., Toronto, has increased its capital from $40,000 to $150,000.

The Grand Trunk Pacific Railway paid out $75,000 in wages to the machinists at its Transcona shops last week.

Ingersoll, Ont., is advertising for teachers of woodwork, mechanical drawing, and electrical engineering for its industrial evening classes.

The Canadian Gold Car Heating & Lighting Co., New York, whose goods are being handled by The W. W. Butler Co., Ltd., will still maintain their office at 346 St. James St., Montreal.

Gorman, Clancy & Grindley, of Edmonton, have offered an engine, boiler and steam pump valued at $2,300 for the use of students at the Edmonton Technical School.

The York Manufacturing Co., makers of refrigerating machinery, York, Pa., have recently installed the following machines in Canada: Northeastern Lunch, Montreal; one 4-ton vertical single-acting belt driven enclosed type refrigerating machine and high pressure side complete; Swift Canadian Co., Vancouver, B.C., one 35-ton horizontal double-acting belt-driven refrigerating machine and high pressure side complete.

The John Morrow Screw and Nut Co., Ingersoll, Ont., increased their earnings 25 per cent. in the fiscal year just ended. The net earnings amount to $89,066. The company is an amalgamation of the Ingersoll Nut and Bolt Co. and the John Morrow Screw Co., and since the amalgamation of the plant has been extended, and new machinery installed. The president and managing director is J. A. Coulter, Ingersoll.

Graton & Knight Mfg. Co., the well-known makers of leather belting, whose headquarters are at Worcester, Mass., have found their Canadian business increasing so rapidly that they have decided to add a Canadian depot to their already numerous branch houses. For this purpose they have rented 2,200 square feet of space in the Unity Building, Montreal, which they will fit up as an office and warehouse. A full line of belting will be carried in stock at the above address to enable prompt service to be given to customers. The Canadian business will be looked after by Mr. F. G. Hickey.

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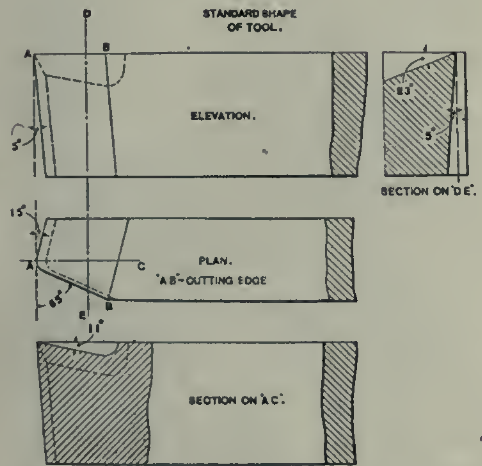
Determining the Cutting Power of Lathe Turning Tools*

By William Ripper, D. Eng. D.Sc. and G. W. Burley **

The question of the definite measure of the output of work, or of the removal of material, of which lathe-tools are capable, is one about which there is very little information readily available; and it was for the purpose of determining the behavior of cutting tools over a fairly wide series of working conditions, and of deducing therefrom some practical results, that the experiments here detailed were undertaken.

THE object of the tests here described and illustrated includes the determination of the way in which the output of both high-speed and ordinary carbon-steel tools is affected by such elements as the speed of cutting, the depth of the cut, the feed of the tool per revolution

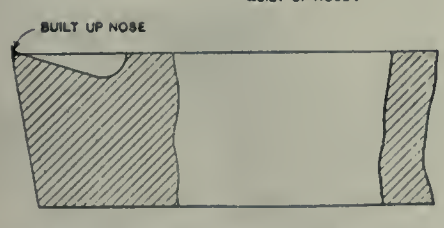
Fig. 1



of the work, the shape of the nose of the tool, and the physical properties of the metal upon which the cutting tool is acting. In particular, the question of the association of a high speed and a light cut versus the association of a low speed and a heavy cut, received consideration with a view to finding the relation of these two factors to maximum output.

Further points were to determine whether the above relationships are on the whole as regular and uniform as they may reasonably be expected to be when

Fig. 3.
DIAGRAM SHOWING BUILT-UP NOSE.

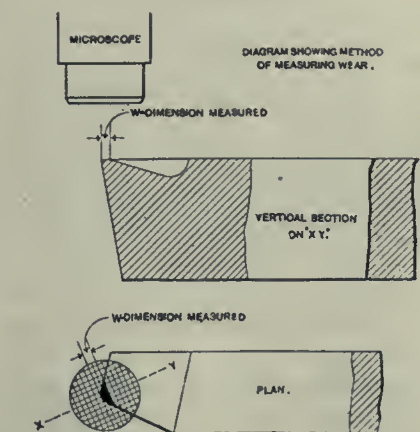


the conditions of the tests are approximately uniform; or whether they are irregular and erratic as they have sometimes been reported to be; also whether the usual workshop notions as to the durability of tools at varying cutting speeds are confirmed by careful experiment.

Types of Tools Tested.

Two classes of tools were tested—namely, ordinary carbon-steel tools and

Fig. 2.



high-speed steel tools. By the term carbon-steel tools is meant tools made of ordinary tool-steel as distinguished from those made of self-hardening steels

Fig. 4.
RELATION BETWEEN WEAR AND TEST-DURATION.

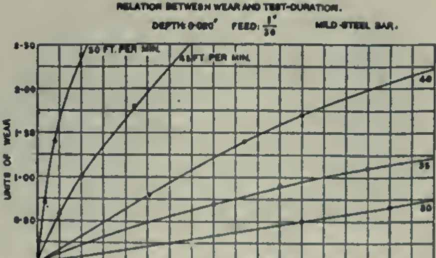
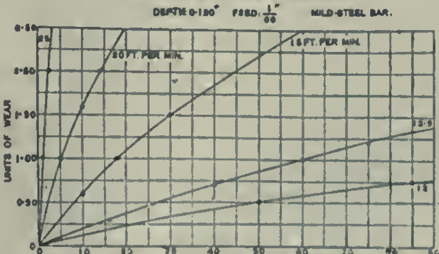


Fig. 5.
RELATION BETWEEN WEAR AND TEST-DURATION.



and high-speed steels. The characteristic composition per cent. of carbon tool steel is approximately as follows:—

Carbon	1.3
Silicon	0.12
Manganese	0.2
Sulphur	0.02
Phosphorus	0.01

Its characteristic behaviour as a cutting tool is that it possesses the property of becoming hardened by heating and quenching, and of retaining its hardness while working as a cutting tool up to a temperature at the nose of about 300 degs. C., beyond which temperature the hardness disappears and the cutting edge of the tool softens.

By the addition, however, of certain materials in the manufacture of carbon tool-steel, the temperature of stability of the hardness, or, in other words, the temperature at which the steel softens or breaks down, due to the heat generated by friction at the nose of the tool, is raised, and the ability of the tool to cut is greatly improved. The first step in this direction was made by the addition of tungsten to the ordinary carbon-steels forming the celebrated Mushet or self-hardening steel, and raising the temperature of the softening point to about 400 degs. C. Later, by the further addition of chromium, and afterwards of vanadium, we have the still more cele-

Fig. 6.
RELATION BETWEEN WEAR AND TEST-DURATION.

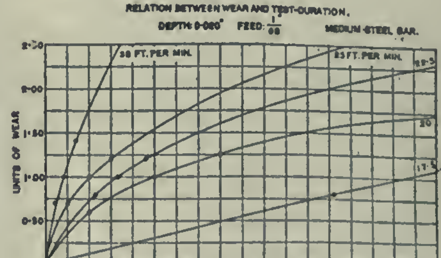
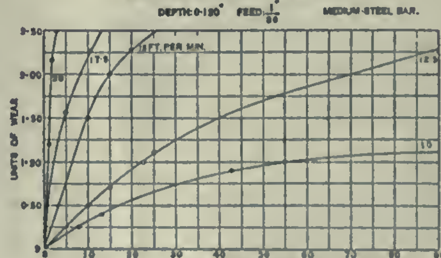


Fig. 7.
RELATION BETWEEN WEAR AND TEST-DURATION.



brated high-speed steels with a considerably increased temperature of stability of their hardening properties, the steel

*From a paper read recently before the Institution of Mechanical Engineers.

**Dean of the Faculty of Applied Science and of the Staff, respectively, of Sheffield University.

retaining its cutting edge for a short time, even at a visible red heat.

The increased working temperature of the steel thus produced by the addition of these metals to ordinary carbon-steels has resulted in increasing enormously their capacity for output by increasing the possible cutting speeds, as well as the possible depths and feeds of cuts taken.

Carbon-Steel Tool Tests.

The ordinary carbon-steel tools tested were made from ¾-inch by ½-inch bars, 6 inches long, and the tools were ten in number. The shape of the tool nose adopted as the standard shape for the first set of tests was that indicated in Fig. 1, in which an elevation and plan of the nose are shown. The side cutting edge AB is horizontal and inclined at an angle of 25 degs. to the length of the tool, so that when the tool is in its correct position in the slide rest, the cutting edge makes an angle of 65 degs. to the axis of the work or test-bar between the centres. The end of the tool is inclined at an angle of 75 degs. to the length. The angles of the tools were as follows:

Top rake—front=11 degs. Front or heel clearance = 5 degs.

Side rake = 23 degs. Side clearance = 5 degs.

These angles were ground exactly, on every tool tested, on a Universal tool grinder, so that the question of the angles of the tool did not affect the comparative results in the first part of the research.

Test Bars.—The test bars on which the carbon-tools were tested were steel bars of various chemical compositions and physical properties, four different classes being worked upon, marked W. X, Y, and Z, and varying in composition from 0.23 per cent. of carbon to 0.82 per cent. of carbon. The bars were made from ingots cast in the metallurgical laboratories of the University of Sheffield, under the direction and with the kind co-operation of Dr. J. O. Arnold, F.R.S., and were about 2 feet 6 inches long and 6 inches in diameter when finished, after hammering and annealing.

Fig. 8.
RELATION BETWEEN WEAR AND TEST-DURATION.
DEPTH: 0·020″ FEED $\frac{1}{56}$ HARD-STEEL BAR.

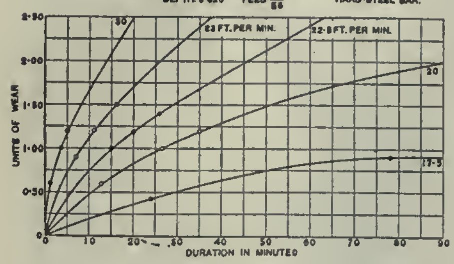


Fig. 9.
RELATION BETWEEN WEAR AND TEST-DURATION.
DEPTH: 0·120″ FEED: $\frac{1}{56}$ HARD-STEEL BAR.

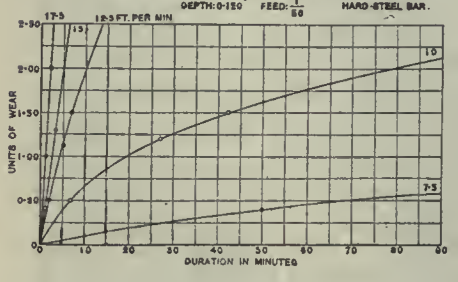


Fig. 10.
RELATION BETWEEN WEAR AND TEST-DURATION.
DEPTH: 0·020″ FEED: $\frac{1}{36}$ VERY-HARD-STEEL BAR.

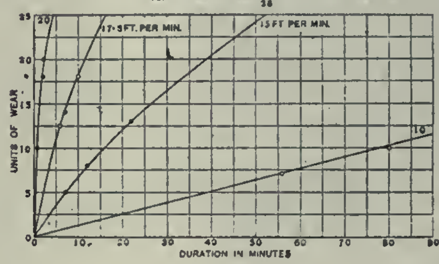
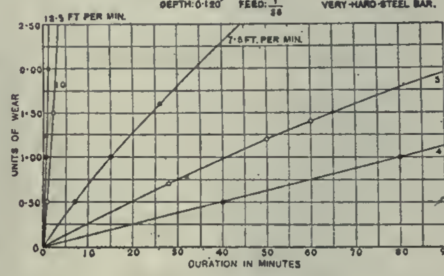


Fig. 11.
RELATION BETWEEN WEAR AND TEST-DURATION.
DEPTH: 0·120″ FEED: $\frac{1}{36}$ VERY-HARD-STEEL BAR.



Test Lathe.—The tests were made in a 6 foot by 6 inch centre Lang lathe fitted with a variable-speed gear, so that fine adjustments of cutting speed could be obtained through a fairly wide range; this range being from 10 feet per minute to 300 feet per minute on a diameter of 6 inches.

Fig. 12.
CUTTING SPEED AND DURATION TO PRODUCE STANDARD BLUNTNESS.
CARBON TOOLS ON MILD STEEL.

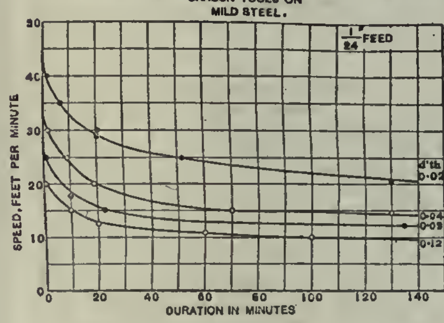
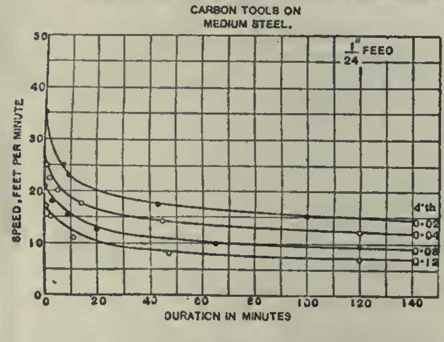


Fig. 13.
CUTTING SPEED AND DURATION TO PRODUCE STANDARD BLUNTNESS.
CARBON TOOLS ON MEDIUM STEEL.



Measure of Standard of Bluntness of Tool.—The method adopted in testing these tools involved the microscopic examination of the cutting edge, this being found to be the only possible method of establishing a standard of measure of the working life of the tool. Each tool was allowed to cut for a certain number of minutes at a selected speed with a selected area of cut (depth of cut by feed of tool per revolution of test-bar), at the end of which time the tool was removed from the tool-holder and then placed under the microscope for the purpose of examining the cutting edge to see to what extent the edge had been dulled or blunted. A micrometer screen in the eye-piece of the microscope enabled the amount of the blunting to be measured. The dimension, which was measured in each case, is indicated in Fig. 2. The degree of blunting, as it may be termed, was not in any case of a uniform width along the nose of the tool, but the width actually measured (that is, the dimension W) was the greatest width that could be found under the microscope in each case. To determine the limiting duration of the test, that is, the duration to produce unit bluntness, three and sometimes four tests and microscopic examinations were made on each tool at one constant cutting speed and area of cut, the tool being measured for bluntness after each test, and then replaced in exactly the same condition and position in which it was when removed from the lathe. Thus, the values of W corresponding to three or four durations were obtained, and

Fig. 14.
CUTTING SPEED AND DURATION TO PRODUCE STANDARD BLUNTNESS.
CARBON TOOLS ON HARD STEEL.

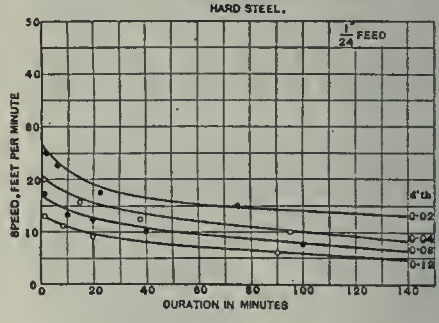
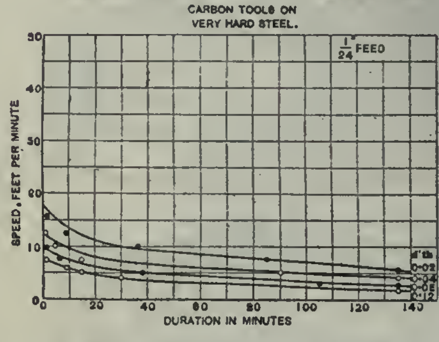


Fig. 15.
CUTTING SPEED AND DURATION TO PRODUCE STANDARD BLUNTNESS.
CARBON TOOLS ON VERY HARD STEEL.



from these results curves were plotted, and the duration of the test which corresponded to what was adopted as the "unit" or "standard wear" was found by measurement from the curves.

In no other way was it found possible or practicable to obtain this duration satisfactorily. The "unit" or "standard wear" adopted finally was 0.005 inch, as this was found to be about the average amount of blunting which is usually allowed on the cutting edge of a carbon-cutting tool in practice before it is re-sharpened. In the plan, Fig. 2, the squares are ruled on the micrometer screen to the standard width, and W is shown equal to 1.9 units or 1.9 by 0.005, that is, 0.0095 inch.

This method of testing the durability of tools was finally adopted after repeated failures to find a method of determining a standard breaking-down point for the tool. One difficulty arose from the almost invariable tendency of the tool to build up a new nose, or new cutting edge, on the point of the original one, as shown in Fig. 3. This new nose appeared to form a protecting cutting edge for the tool and to prolong indefinitely its life, but on examining the matter more closely it was found that, although a sharp nose was being presented to the work, a cumulative blunting action was going on all the time on the cutting edge of the tool below the false nose.

As soon as this blunting effect was discovered, it became an easy and straightforward task to find a measure of bluntness of the given tool for any given duration of cutting speed and dimension of cut. The false nose is formed by particles scraped from the work, which form themselves into a solid mass between the chip, the work, and the nose of the tool, the false nose becoming larger as the tool itself becomes blunter; the blunting of the tool itself being due apparently to the pressure transmitted to the cutting edge of the tool through the superimposed material. The built-up nose had, of course, to be removed before a microscopic examination of the bluntness of the cutting edge could be made.

Relation Between Wear of Tool and Duration of Test.

Representative curves showing the relation between the wear of the cutting edge (or the above dimension W) and the duration of the test are given in Figs. 4-11. Each set of curves constituting the whole figure represents experiments made with a definite area of cut—depth of cut by feed of the tool per revolution of the test-bar. Each curve represents experiments made at a definite cutting speed. The areas of cut and test-bar designation numbers for which these Figs. 4-11 stand are as follows:—

		Inch		Inch		
Fig. 4—Area of Cut	=	0.020	×	1-36	............Bar W	(Mild Steel)
Fig. 5—Area of Cut	=	0.120	×	1-36	............Bar W	(Mild Steel)
Fig. 6—Area of Cut	=	0.020	×	1-36	............Bar X	(Medium Steel)
Fig. 7—Area of Cut	=	0.120	×	1-36	............Bar X	(Medium Steel)
Fig. 8—Area of Cut	=	0.020	×	1-36	............Bar Y	(Hard Steel)
Fig. 9—Area of Cut	=	0.120	×	1-36	............Bar Y	(Hard Steel)
Fig. 10—Area of Cut	=	0.020	×	1-36	............Bar Z	(Very Hard Steel)
Fig. 11—Area of Cut	=	0.120	×	1-36	............Bar Z	(Very Hard Steel)

The following is a complete list of all the areas of cut used in the tests with carbon-steel tools, these being used on each of the four classes of test-bar:—

Depth of Cut.		Feed per Revolution.			
Inch.		Inch.	Inch.	Inch.	Inch.
0.020	×	1-12	1-24	1-36	1-48
0.040	×	"	"	"	"
0.080	×	"	"	"	"
0.120	×	"	"	"	"

An important limitation to the size of cut is the heavy cost of material used up during the tests; but although the areas of cut taken are small, they include the conditions under which a very large proportion of the machine-tool work of the world is done. Altogether about 320 cutting-speed and cut-area combinations were taken, involving the making of about 1,000 individual micro-examinations of the cutting edges of the tools. In all cases the work has been run dry, that is, without lubrication at the cutting edge of the tool.

Cutting Speeds to Produce Standard Bluntness.

From each set of wear-duration curves, Figs. 4-11, the durations for standard or unit bluntness at the selected cutting speeds were measured, and these were utilized to form speed duration curves, such as are shown in Figs. 12-15. Thus, on Fig. 4, the dots or points indicate the results of actual measurements of wear for given cutting speeds; then, by noting the points of intersection of the horizontal line of unit bluntness, with the respective curves, the corresponding durations are obtained. These results, arranged as a separate figure, form the curves of duration for unit or standard wear at given cutting speeds. Each curve of this set corresponds to one set or batch of curves of the wear-duration variety. These four figures contain representative curves for each of the four test-bars as follows, the areas of cut being as given:

Fig. 12—Bar W.......Areas of Cut = 0.02, 0.04, 0.08, and 0.12 × 1-24 in. feed.
Fig. 13—Bar X.......Areas of Cut = 0.02, 0.04, 0.08, and 0.12 × 1-24 in. feed.
Fig. 14—Bar Y.......Areas of Cut = 0.02, 0.04, 0.08, and 0.12 × 1-24 in. feed.
Fig. 15—Bar Z.......Areas of Cut = 0.02, 0.04, 0.08, and 0.12 × 1-24 in. feed.

These curves, owing to their tendency to become horizontal, seem to indicate that there is a cutting speed for each area of cut and each test-bar, beyond which the tool would last more or less indefinitely under the given conditions; in other words, it would cut efficiently for many hours, but if this speed is exceeded by from 15 to 25 per cent. the conditions are such that the tool will fail somewhat rapidly.

Effect of Hardness of Bar on Cutting Speed.

Comparisons between the four test-bars in regard to the relation between the cutting speed and the cutting time are made in Fig. 16. The area of cut selected is 0.040 inch by 1-24 inch, and the tools are run at a given speed until they reach standard bluntness. The figure shows that, for any given cutting time the harder the bar the lower the cutting speed, the ratio of the cutting speeds for any given life of the tool being approximately equal to the inverse ratio of the carbon contents of the bars. Thus, for an 80 minutes' run, the cutting speed, Fig. 16, for the hard bar ($C = 0.82$) is 5 feet per minute, and the cutting speed for the soft bar ($C = 0.23$) is 15 feet per minute; that is, the cutting speeds are, roughly, inversely proportional to the carbon contents, as also to the tensile strength. The exact degree in which the cutting speed is affected by the tensile strength of the bar is given later.

It also shows that, for all the bars, the high cutting speeds are associated with the short durations or times of cutting, so that if the cutting speed is increased the time of cutting required to produce the standard amount of wear is reduced. The relationship between the increase of speed and the reduction of time is not a very simple one, but, for cutting times between 10 minutes and 100 minutes, the average duration is found to be:—

$$M = \frac{\text{constant}}{S^5} \quad . \; . \; . \; (1)$$

where S = the cutting speed in feet per minute, and M = the time of cutting in minutes, required to produce the standard amount of wear on the cutting edge of the tool. That is, the duration of cutting is approximately inversely proportional to the fifth power of the cutting speed. The value of the constant depends, of course, upon the test-bar, or the composition and properties of the metal being machined, and the area of cut.

Standard Tests.

To systematize matters it was decided to make a standard test, which should produce a condition of unit bluntness of the cutting edge of the tool after a 60 minutes' run. This unit bluntness in 60 minutes could be obtained in various ways by a series of combinations of speeds and areas of cut. These results were then combined into one curve, as shown in Fig. 17, the upper curve representing such a series for the mild steel test-bar W, and the lower curve representing respectively the other bars of gradually increasing hardness X, Y, Z.

Fig. 16.
EFFECT OF HARDNESS OF BAR ON CUTTING SPEED AND DURATION TO PRODUCE STANDARD BLUNTNESS.

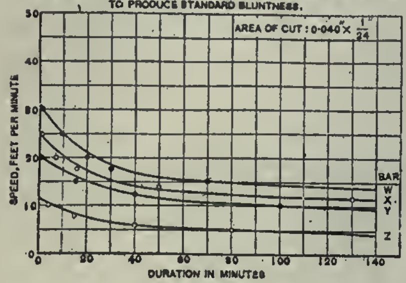
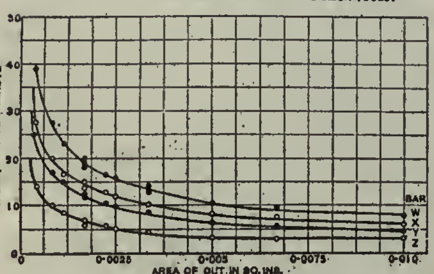


Fig. 17.
RELATION OF CUTTING SPEED TO AREA OF CUT TO PRODUCE STANDARD BLUNTNESS IN 60 MINS
CARBON TOOLS.



With each given area of cut there is a certain speed which will produce standard bluntness in 60 minutes, this speed having been termed the "associated" cutting speed for the given area of cut. In this series it has not been found necessary or possible to separate the two factors of depth of cut and feed, which make up the area of cut, because with carbon tools in practice the cuts are comparatively light, and the differences of result produced by changing the ratio of these factors are so small as to be almost negligible. The relation between the area of cut and the associated cutting speed is found to obey approximately the law:

$$AS^2 = \text{a constant} \quad . \quad . \quad . \quad (2)$$

$$\text{or } S = \frac{\text{constant}}{\sqrt{A}} \quad . \quad . \quad . \quad (3)$$

where A = area of cut, and S = cutting speed in feet per minute. The value of the constant depends upon the composition of the bar.

Output Curves.—From the curves, Fig. 17, the speed associated with each area of cut was measured, and with these factors the output or the number of cubic inches of material removed per hour was calculated, and the curves, Fig. 18, constructed therefrom. The ordinates of the curve = area of cut × cutting speed × 12 × 60 = cubic inches turned off per hour.

Effect of Hardness of Test-bar, Speed, and Cut-area on Output.—It will be seen from Fig. 18 that for any given cutting speed with its associated area of cut, to give the tool a life of one hour, the volume of metal removed is greatest with the softest bar and least with the

Fig. 18.
EFFECT ON OUTPUT OF INCREASED CUTTING SPEED WITH ACCOMPANYING REDUCED AREA OF CUT.
CARBON TOOLS.

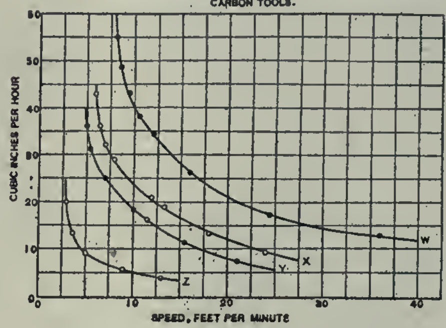
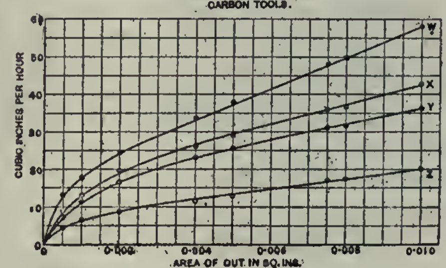


Fig. 19.
EFFECT ON OUTPUT OF INCREASED AREA OF CUT WITH ACCOMPANYING REDUCED CUTTING SPEED.
CARBON TOOLS.



hardest. It also shows that large output is by no means associated with high cutting speed, but that as the cutting speed is reduced with, of course, a suitable increase in the area of cut, the output is increased; in other words, a heavy cut is better than a high cutting speed.

Thus it will be seen that, for bar W, when the cutting speed is 10 feet per minute, the volume of metal removed per hour is 40 cubic inches when the associated area of cut for this speed is used; whilst when the speed is, say, 20 feet per minute, and the associated area of cut is correspondingly less, the volume removed is only about 21 cubic inches. Hence, as a general law, it may be stated that for maximum tool output the area of cut employed is a maximum and the associated cutting speed is correspondingly low.

This is also indicated in Fig. 19, which gives the relation between the volume of metal removed in the hour under the standard conditions, and the area of cut It will be seen that the greater the area of cut, accompanied by its appropriate or "associated" cutting speed, the greater the volume of metal removed. In other words, a low cutting speed and heavy cut combination is preferable to a high cutting speed and light cut combination from the point of view of output. Fig. 19 shows further that with a fixed area of cut and its accompanying associated speed, the ratio of the output on steels of varying hardness is inversely proportioned to the tensile strength of the material being machined.

Relative Hardness of Material as Measured by Tensile Strength.—To determine the relative hardness of the material turned, many methods were tried, but it was ultimately found that the test of the tensile strength of the material was the most reliable and conveniently-made test of relative hardness, the hardness being practically directly pro-

Fig. 20.
RELATION OF STANDARD CUTTING SPEED TO TENSILE STRENGTH FOR VARYING AREAS OF CUT.
CARBON TOOLS.

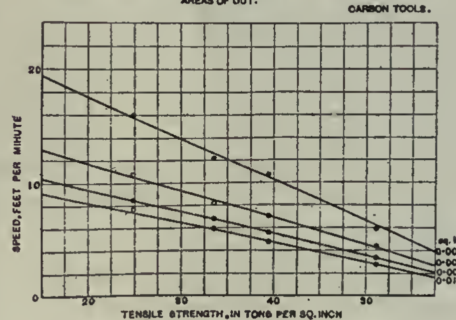


Fig. 21.
PLAN AND ELEVATION OF TOOL WITH LONG CUTTING EDGE 'A B'.

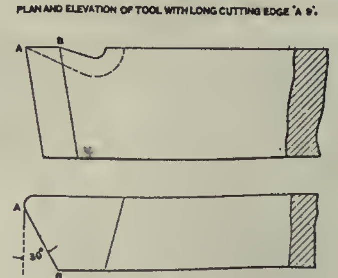


Fig. 22.
DIAGRAM SHOWING EFFECT OF SHAPE OF NOSE UPON LENGTH OF CUTTING EDGE OF TOOL.

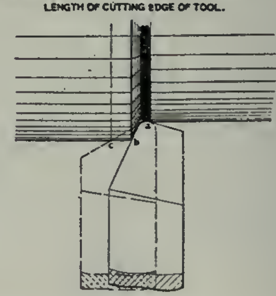
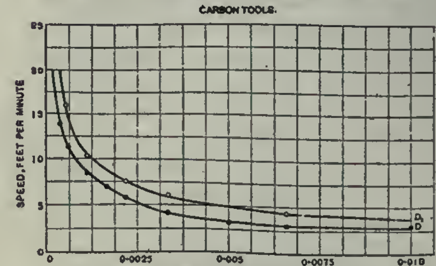


Fig. 23.
CURVES SHOWING EFFECT OF LENGTH OF CUTTING EDGE ON CUTTING SPEED.
CARBON TOOLS.



portional to the tensile strength. The crushing test of a sample compression piece would seem to be the most reasonable test of hardness of a material, but the comparative hardness determined in this way was as nearly as possible similar to that obtained by comparing the tensile strengths.

Relation between Tensile Strength of Material and Cutting Speed of Tool.—In Fig. 20 is shown the relationship between the tensile strength of the metal being machined and the associated or working cutting speed for four different areas of cut, the speed and the area of cut being associated to give a standard life of 60 minutes to the tool. The law is a straight-line law, the equation to it being:—

$$S = \frac{(67-T)\times 0.0185}{\sqrt{A}} \quad (4)$$

where S = the associated cutting speed in feet per minute; T = the tensile strength of the metal being machined in tons per square inch; and A = the area of cut in square inches.

Effect of Shape of Nose of Tool on Cutting Speed.—To determine the effect of a change in the shape of the nose of the tool, and in the disposition of the cutting edge with respect to the axis of the test-bar, tools having a shape of nose as represented in Fig. 21 were tested against tools of the shape of Fig. 1 (see Fig. 22). The same conditions as to test were adopted in each case, that is, the tools were tested for wear of the cutting edge, with a standard tool life of 60 minutes.

Under these conditions, the relation between the cutting speed and the associated area of cut was determined. This relation is indicated graphically in Fig. 23, the curve D_1 being obtained with the form of tool nose represented in Fig. 21, and the curve D with the original or standard shape of nose, Fig. 1. It will be seen that for each area of cut the associated cutting speed is less for the standard shape of nose, which has a comparatively short cutting edge (a, b, Fig. 22), than it is for the second shape of nose, which has a longer cutting edge (a, c, Fig. 22). These speeds have an average ratio of 1 to 1.40, which ratio is also approximately that of the length of the respective cutting edges of the tools in contact with the work.

In other words, for a given depth of cut, the associated cutting speeds of tools for a given amount of wear are directly proportional to the length of the cutting edge of the tool in contact with the work, that is, a proportionately greater output can be obtained with the tool having a longer cutting edge. In all other respects the angles of the tools were the same.

Summary of Conclusions.

1.—Blunting of the cutting edge develops more rapidly at high speeds than at low speeds, given the same area of cut, and the same shape of nose of tool.

2.—The durability of carbon-steel tools is in all cases some function of the reciprocal of the cutting speed, in other words, the higher the cutting speed the shorter the durability of the tool, and vice versa.

3.—Assuming a standard amount of bluntness of 0.005 inch, the cutting speed to produce this bluntness is inversely proportional to the fifth root of the duration or life of the tool for durations between 10 and 100 minutes for any given area of cut, or conversely the life of the tool is inversely proportional to the fifth power of the cutting speed. This law does not hold good for durations which are external to these limits.

4.—The cutting speed duration curve beyond the point representing a duration of 100 minutes tends to become horizontal, this suggesting that there is, in each case, a definite cutting speed below which the tool would last practically an indefinite length of time.

5.—For a standard tool life of 60 minutes and a standard amount of bluntness of 0.005 inch, as determined by means of the microscope, high cutting speeds are invariably associated with light cuts, and low cutting speeds with heavy cuts.

6.—The associated cutting speed for a given area of cut is not influenced by the manner in which the area of cut is made up— that is, the influence of the depth of the cut upon the associated cutting speed is exactly the same as that of the feed. This applies only to carbon-steel tools with which cuts of small area only are possible; with high-speed steel tools this condition does not apply.

7.—The associated cutting speed is not reduced or increased in the same ratio as the area of cut may be increased or reduced.

8.—The associated cutting speed for any area of cut depends upon the hardness of the metal which is being machined, a high speed being associated with a low degree of hardness or vice versa.

9.—For a given area of cut with its associated cutting speed, the output of the tool acting on steels of various qualities is roughly inversely proportional to the tensile strength of the respective materials being machined.

10.—A tool working at a low speed with its associated area of cut will remove far more material under standard conditions in one hour than one which is working at a high speed with its associated area of cut.

11.—A tool with a long cutting edge has a longer life (under similar conditions of area of cut, cutting speed, and hardness of metal being machined) than one which has a short cutting edge.

The foregoing constitutes the data from the carbon steel tool tests; that relating to the high-speed steel tool tests will be found in our December 18 issue.

GAS FOR INDUSTRIAL PURPOSES.

ACCORDING to a paper on "Gas for Industrial Purposes," recently read by H. M. Thornton, before the British Commercial Gas Association, an engineer associated with the Indian Railways has introduced a new brazing material in connection with which the use of town gas is advocated. Heavy castings, such as large gear wheels and embossing presses, which have been fractured, have been successfully repaired with the new brazing material by the use of gas blow-pipes.

Etchings on Brass.

For etching on brass, a satisfactory ground, it is stated, can be made from equal parts of beeswax, Burgundy pitch, and asphaltum. These constituents are melted together and thoroughly stirred in order to secure a uniform mixture. This ground is warmed before using and spread evenly over the surface to be etched. When the ground has had time to cool, it is removed from the sections of the metal to be etched, after which the etching fluid is applied. A satisfactory etching fluid consists of one part of nitric acid to four parts of water. After the "biting" has been completed, which takes only a few minutes, the work is dipped in hot water to wash off the acid. The surface of the work can then be cleaned by wiping it with a cloth dipped in benzine or petrol.

Oil Fuel.

The use of oil fuel on a more extensive scale by the railways, steamships, and other large consumers in the Argentine, states the Railway Gazette, has hitherto been retarded owing to the uncertainty of local supply and the instability of price. The fact, however, that oil would be the most economical fuel is the general opinion among the State and private railway officials. The Government has not only been spending large sums in exploring for oil wells, but has been carrying out experiments with locomotives equipped for oil burning. The Buenos Aires Great Southern and Buenos Aires and Pacific Railways have also been similarly experimenting with remarkable success. Generally speaking, the results of the experiments have shown that the substitution of oil for coal would not only increase locomotive efficiency, but would effect substantial savings in the fuel bill. Basing the operating on the results obtained on the Mexican Railways, four barrels of oil, or about one-sixth of a metric ton, would do the same work as one metric ton of coal. Taking the price of oil at $7.00 and coal at $10.50, the proportion would be as 4½: 7.

The New Grey Iron Foundry of Sheldon's Ltd. Galt, Ont.

Staff Article

In our October issue we described the foundry layout and equipment of a large railroad rolling stock manufacturing corporation. In the present instance the nearly completed foundry of a widely known general engineering concern is featured, and it will be noted from a perusal of the details given that equal enterprise is shown in the latter, by the provision of an up-to-date building and modern accessory apparatus to secure the highest efficiency and maximum output.

A LARGE grey iron foundry has recently been completed by Sheldon's, Ltd., Galt, Ont. Fifteen years ago this Company built their first foundry as an adjunct to their general engineering business. The foundry staff at the initial stage consisted of two men, one of these being Mr. A. Oliver, the present foundry superintendent. Additions were made at various times to the old foundry, until the volume of business made it imperative that a new and more commodious foundry should be built. The result is a building of modern construction, as fireproof as is possible to make it, laid out on the most up-to-date lines, and equipped with the latest machinery. No expense has apparently been spared to achieve these ideals, and this should reflect favorably on the other departments, as grey iron castings enter very largely into the general products made by the Company. One of the many features that attracts the notice of the observer is the general brightness of the building, and which is a contrast to the gloom generally met with in this department, and this, together with the clean air conditions, will have a favorable effect on the employees, and, therefore, result in greater efficiency.

Construction Features.

The foundry is located on the north side of the Company's property, and lies parallel to the old foundry, and also to the machine shop, with the main power house 150 feet distant. The building is of fireproof construction, having steel frames and columns, with walls of hollow tile set in cement mortar and covered inside and outside with cement plaster. Windows extend the full length and breadth of the building, also in the monitor above the centre bay. "Fenestra" steel sash is used throughout, and ample ventilation is obtained by having sections of each set of windows made to open; the windows in the monitor connected up in sections of three, being opened mechanically by hand wheels, and those in the bays opened individually by hand. The roof is made of 2 inch matched boarding covered with Barrett roofing.

The foundry is 190 ft. long by 110 ft. wide, and is divided into three bays, the centre bay being 40 ft. wide, with a clearance height of 34 ft., and the side bays being 35 ft. wide, with a headroom of 170 ft. The floor of the centre or main bay is used entirely for moulding, while the south bay is divided into sections, the east end section containing the heating and air washing plant and cupola blower.

In the next section is the core room, with the core drying ovens just beyond. Then comes the cupola and charging floor; further on the brass furnaces, and at the extreme end of this bay are situated the tumblers. In the north bay are located the moulding machines, while the floor is used for making light castings. The foreman's office, 25 x 16 ft., is located at the eastern end of the north bay.

INTERIOR NEW GREY IRON FOUNDRY, WHEN NEARING COMPLETION, SHELDON'S, LTD., GALT, ONT.

INTERIOR OF FOUNDRY, CENTRE BAY.

General Electric motor. A Fairbanks scale is installed on the charging floor for weighing the different materials used in the cupola, while draft for the cupola is supplied by a blower unit, described later.

Heating System.

Provision has been made for a heating and air washing system. This plant will be located at the eastern end of the south bay, and will occupy a space 35 x 32 ft. The air washer, made by the Company, will have a capacity of 50,000 cubic feet, while the heating coils will be made of W.I. pipe. A No. 50 Keith fan, driven by a 25 h.p. Sheldon vertical, high speed, enclosed steam engine, is used in this connection. The air will be delivered through two concrete tunnels, one on each side of the main bay and extending the full length. Ducts made of galvanized iron will be connected with the tunnel at each column, each duct being fitted with a damper. In warm weather the coils will be filled with cold water, instead of steam as in the winter. By this system an even temperature will be maintained, and no heating coils will be necessary. In this section is situated a No. 9 Sheldon blower driven by a Sheldon 25 h.p. vertical high speed enclosed steam engine. This supplies air at 12 ozs. pressure to the cupola already described. Provision has been made for a duplicate set when the other cupola is installed. Above this section will be a wash room and lavatories and individual steel lockers made by the Company. A shower will also be fitted.

Core Room and Ovens.

The core room and ovens occupy a space 48 x 35 ft. There are the usual facilities for making cores, and four ovens, 8 x 14 ft., 6 x 14 ft., and 4 x 14 ft., equipped with tracks, upon which run the trucks. The fourth is a drawer oven, and is 4 x 12 ft. The ovens are heated with individual coke stoves, and the gases are carried away by a chimney located outside the foundry.

The Cupola Feature.

There is at present one cupola in operation, this being 36 in. diameter inside, and having a capacity of 5 tons per hour. The Company built this cupola themselves, and have made provision for a larger one, which will be 46 in. diameter, and have a capacity of 10 tons per hour. The charging floor is 35 x 48 ft., and materials are carried up by means of an Otis Fensom electric hoist, 7 x 4 ft., having a capacity of 2,000 lbs., and operated by a 7½ h.p. 550 volt Can.

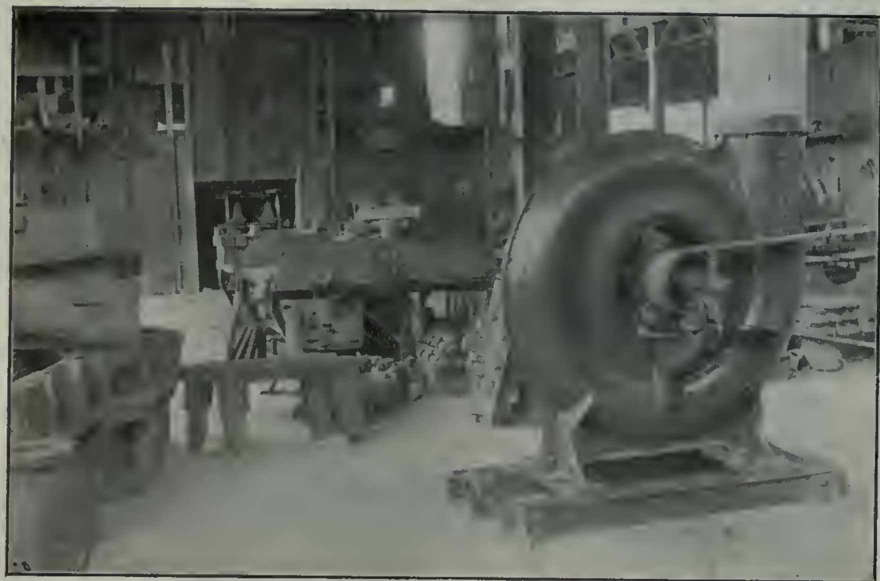
CLEANING ROOM AND TUMBLING MILLS.

INTERIOR OF FOUNDRY, NORTH BAY.

Crane Equipment.

The present crane equipment includes a 15 ton "Northern" overhead traveller, made by the Northern Crane Works, Walkerville, Ont. This is electrically driven, and operates over the main bay.

It has three D.C. motors, 15, 10 and 5 h.p. respectively, which receive current at 220 volts from 50 a k.w. motor generator set situated in the main power plant. The motor generator is an A.C. machine, and is operated by Hydro-Electric power, and was supplied by the Can. Gen. Electric Co. Arrangements are being made by the Company to generate their own power. A 1 ton electric travelling crane will be installed in the core room and one of greater capacity in the north bay. A number of jib cranes will also be installed in the main bay.



CORE OVENS AND CUPOLA BLOWER.

Cleaning Room.

The equipment in the cleaning room at present consists of four rumblers, supplied by the W. W. Sly Mfg. Co., Cleveland, Ohio. These are 48 in. x 48 in. x 72 in. long, 24 in. x 44 in. x 48 in. long, 24 in. diam. x 48 in. long, and 18 in. diam. x 48 in. long respectively. There are also several grinders and a sand sifter, while provision has been made for a sand blast.

Moulding Machines.

In the north bay are six moulding machines. These consist of three roll-overs and one squeezer, supplied by the Tabor Mfg. Co., Philadelphia, Pa.; one roll-over and jarring machine, by the Davenport Machine & Foundry Co., Davenport, Iowa, and one roll-over and squeezer, by the Arcade Mfg. Co., Freeport, Ill. In addition to the above are two pulley molding machines, supplied by E. A. Delano Co., Chicago, Ill., one for moulding pulleys, 8 to 16 in. diam., and the other for pulleys from 17 in. to 30 in. diam. There is also one stripper by the Killen Mfg. Co.

Piping System.

A tunnel of reinforced concrete, 4 x 3 ft. x 150 ft. long, has been constructed between the boiler room and new foundry. Through this tunnel are taken the steam air and water pipes. The steam pipe is 6 in. diam., and supplies steam to the fan and blower engines. The air pipe is 4 in. diam., and conveys air from the compressor to the moulding machines and for general purposes. The water pipe is 2½ in. diam., and conveys water from a spring on the property for drinking and other purposes. The air and water pipes are carried overhead, and down at each column, where suitable connections are made. The air compressor is located in the main power house, and is a horizontal "Sheldon" machine, with a capacity of 150 cubic feet of free air per minute.

Lighting.

The centre bay has six 2,000 C.P. arc. lamps working at 220 volts, and the side

EXTERIOR NEW GREY IRON FOUNDRY, SHELDON'S, LTD., GALT, ONT.

bays are each equipped with eleven 250 watt tungsten lamps at 110 volts. In addition to the above a number of 110 volt incandescent lamps will be installed for the various machines.

General Feature.

In the main power plant there is a 75 h.p. Wheelock engine, and, in the near future a 75 h.p. "Sheldon" vertical high speed engine driving a generator

CUPOLA AND CORE OVENS.

will be installed. Two 130 h.p. Goldie McCulloch return tubular boilers have been installed recently. When all the improvements to the power plant have been completed. the Company will be entirely independent of outside power.

Mr. Oliver, the foundry superintendent, has under him at present about 60 men, but a much larger number will eventually be employed when all the equipment has been installed and when running at full capacity. There is at present practically a complete equipment, but provision has been made for duplicating a good deal of what already exists, with the exception of the heating plant, which will. of course, be in operation before the winter comes. There is ample room on the property for future extensions when they become necessary. The photographs show the foundry just before completion.

RECORDING MEMORANDA ON ACCIDENT PREVENTION.*

By Thomas D. West.

THERE are few occupations more hazardous and subject to accident through ignorance and error of judgment than the winning of metals from the earth and their conversion into articles of commerce. The risks incident to this, as well as every other activity, whether commercial, industrial, mining or the like, can often be greatly minimized or even averted altogether by conscientious effort on the part of the supervisors of the men engaged. The author has tried in the following paper to give an insight into this phase of the Accident Prevention situation. In fact, this forms one of the forty chapters of a forthcoming work he is publishing on "Developing Overseers and Managing Men and Work." Every person exercising a supervising influence upon men, while seeing that he receives a full day's work from them, should interest himself keenly in the prevention of accidents. Very little attention was paid to the subject six years ago, but owing to the recent universal agitation along this line, the present year, 1913, stands out as unexcelled in this respect.

Decreasing the Number.

In order to decrease the number of accidents materially, two factors must be taken into account. The first is that some accidents, or classes of accidents, could have been prevented by the simple exercise of judgment on the part of men who can reason. The other factor is the less patent one, as it has to do with happenings which cannot be foreseen. Thus, a wreck may occur on a railroad either as the result of an open switch or a broken rail. The first case falls within the range of readily preventable accidents, as the man throwing the switch should have reasoned properly. The latter case, however, could not have been foreseen ordinarily as things go. It may be stated that for every one accident of the latter class, there are many of the first which are readily preventable.

Even the development of the multitude of safety devices, though doing much good along correct lines, has not reduced the accident percentages to any very notable extent, simply because the personal factor—the continually anticipating what would happen if certain conditions prevailed—has not been emphasized properly. It seems unfortunate that our social and business fabric is such that credit is given the man who cures rather than the man who prevents accidents to life and damage to property. Nevertheless this should not deter us from doing our manifest duty as citizens and men in removing every factor that may lead to injury to or actual loss of life and property.

The Supervisor's Part.

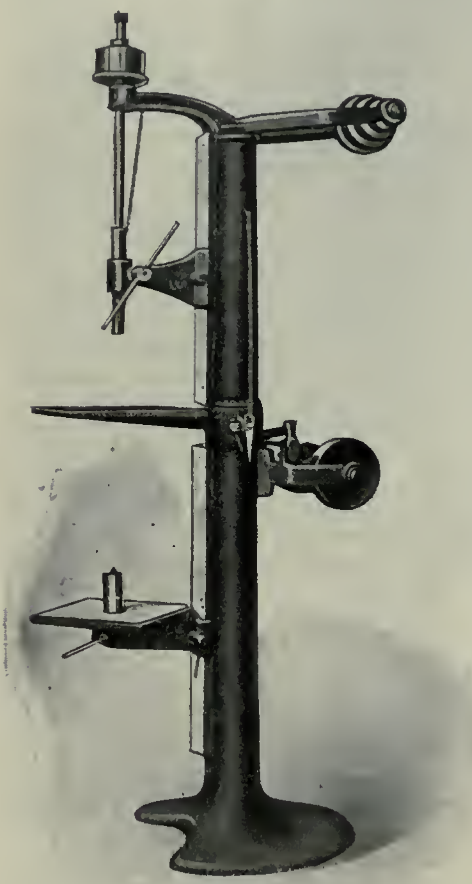
In the nature of things, it is the supervisor of things and men, or the manager of works, who should anticipate possible injury by providing guards of the right kind. He who is deficient in this will soon become obsolete in industrial life. There need only be called to mind the many accident compensation laws passed by the different states between 1911 and 1913. The day has passed when a person may be maimed and receive nothing in the way of compensation. It would need only a few accidents of the very highly paid kind to effectually put a firm out of business, even if covered by insurance, unless the resources were ample.

It is an idea of the author's, and which he has used in a limited way, that the supervisors of a plant should regularly make it a habit to jot down in a memorandum book any matter arising which might have led to an accident, and how this can be forestalled the next time. He has found this to work admirably, while the cost is trifling, and need not be more than half a dollar a year per man acting as foreman, superintendent or manager. Either let the memoranda be jotted down during the day, or at home in the evening in thinking matters over. Doing this soon becomes a habit, and finally a satisfaction. If one can think "Well, I saved that poor fellow's finger to-day," or maybe his leg or life, or prevented a mistake which would have cost heaps of money, there must be a genuine gratification.

While the keeping of such a memorandum book of risks annulled might be overdone by someone using it as a means of advancement for himself, yet employers of labor should foster the idea, and by showing a substantial appreciation, gradually encourage every one interested to do the same and thus enormously reduce accidents. Prevention is always better than cure.

*From a paper read before the recent Foundrymen's Convention in Chicago.

It would indeed be well if regular blank forms were given to the supervisors of a plant with this purpose in view, as from the record of what occurred and what might have resulted therefrom will be learned the advisable safety devices a plant stands in need of special-



SENSITIVE COLUMN DRILL T.2.

ly. Moreover, this can be extended to include accidents which might have been injurious to the property itself, and even the business.

He who has never given a thought to these things, on trying this memorandum record method, will be soon surprised to learn how much can be accomplished by it. He will soon see how many accidents and how much damage he can forestall in making his daily rounds about the shop and among the machinery. There will be many, of course, who will try this method and not find it help them much. This is a matter of individual disposition, and hence the system should not be condemned for failure when the real difficulty lies in the man who uses it.

Accident Liability.

The recent expansion of accident liability is quickly increasing the rating of those works in which the hazards are extra large on account of the indifference of the supervisors. It will eventually cause the rejection of many of them, or at least limit the compensation. It is quite evident that the original plan that every line of business shall have a rating to cover all chances of accident within it will not hold. It will happen that individual concerns will find their premiums advanced beyond others, even if in the same line of work, according to their prevalence of accidents and their character. The ultimate effect will be bankruptcy.

State liability laws are being closely watched as to their effect, and some results have come that have not been anticipated, to the discouragement of those who are anxiously seeking proper protection while desiring justice for their employes. There is a general interest displayed, and the hope seems to prevail that everything will work out right and equitably.

Everything possible should be done by an establishment to keep its supervisors alive to the importance to preventing chances for accident, to adopt accident prevention and safety devices wherever possible, but not to depend upon these devices to the exclusion of the eternal vigilance required from every individual connected with the plant, to consider "safety first." It is admitted that all this makes an extra load to carry, but humanity alone would require it, if indeed the selfish side of it did not make it obligatory at the present time.

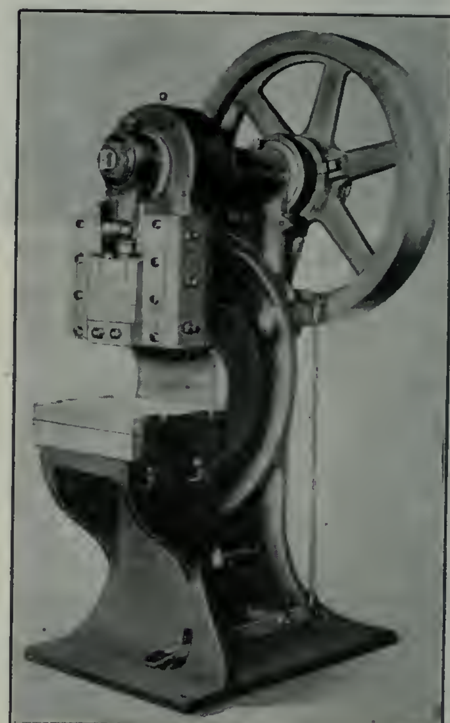
SENSITIVE COLUMN DRILLS.

THE data and illustration refer to the Sensitive Column Drills built by the Hamilton Tool Co., Hamilton, Ont. They are high grade tools designed for accurate and rapid drilling, being capable of producing ½ inch holes, and drilling to centre of a 14 inch circle. The spindle, made from high-grade stock, is carefully fitted and bores to No. 1 Morse Taper. It is driven by 1½ inch flat belt, has three speeds, cut steel rack and pinion feed, and an adjustable stop to gauge depth of holes. It is entirely relieved of belt strain and is counterbalanced by a weight inside of the column, which makes it sensitive to the touch. It has ball bearing thrust and is provided with means for taking up wear and lost motion. The spindle-head is adjustable on slides.

With the machine T.I., one table only is pitted, while on machine T.2., there are two tables, it will be noted from the cut. In the latter case, when the lower table is in service, the upper can be swung around the column out of the way. In both types, the lower table moves the entire length of the column, and the combination centre fits in bracket of this or the only table as the case may be. The countershaft is attached to the machine, and the belt shifter is conveniently arranged, having two handles for manipulation from either side. These drills can be placed under the line shaft, thus avoiding the trouble and expense of putting up a countershaft. The weight of each machine is 300 pounds.

POWER PUNCHING PRESS.

A NEW power punching press is here shown, which combines several features not previously brought together in this type of press. The face of the frame across the gibs is very broad, permitting V-gibe and a large area on bottom of the slide for the support of the upper die or punch. The connection is a steel casting with bronze bushing. The diameter and length of pin bearing is much larger than where the eccentric adjustment is employed, and the adjustment of slide is also considerably in excess of what can con-



POWER PUNCHING PRESS.

veniently be obtained with an eccentric bushing, besides, the adjustment will not slip or change under any load. Two clutch pins are regularly furnished in the fly wheel, so that the clutch will engage every half revolution.

These presses, which are manufactured by the Cleveland Machine & Mfg. Co., Cleveland, Ohio, are built in seven sizes, either plain or geared, and are especially adapted for use in the manufacture of hardware, locks, cutlery, typewriters, automobile parts, and trimming drop forgings.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

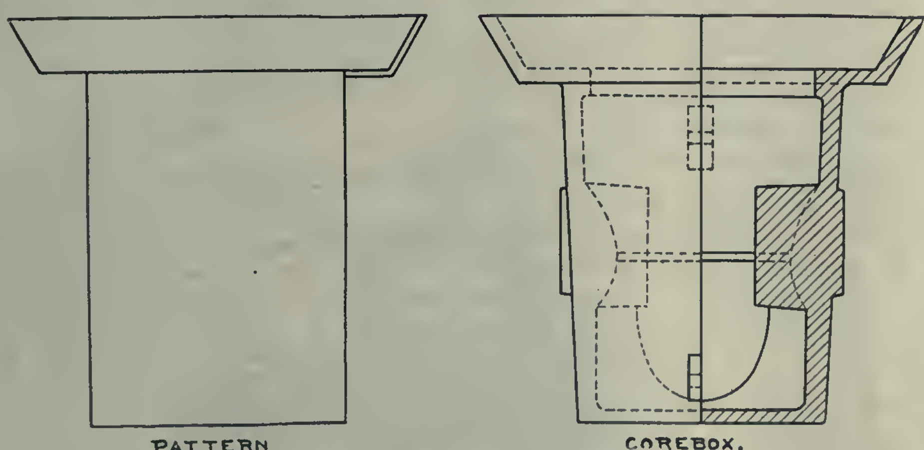
PISTON PATTERNS AND COREBOXES.

IN casting pistons for gasoline engines one of the most satisfactory methods of making the patterns is shown in the accompanying cut. The pattern is solid with an enlarged print to the upper end, and the latter should extend out from one to two inches depending upon the size of the piston. The angle of the print at the sides should be about 30 degrees. Many firms make the cores in two parts, and then paste them together. This method, however, does not produce a true core, as when they are rubbed down and afterwards pasted, it is impossible to get the two halves exactly alike, and there is usually quite a fin cast in the middle of the finished piston.

In the case illustrated a cast-iron corebox is used, being made in two halves. The halves of the box are cast without bosses or ribs on the inside, the edges being then disc ground or planed and afterwards clamped together and dowell pins inserted on either side. While thus clamped, the core box is turned completely out on the inside to the proper dimensions depending upon the piston, the upper part, of course, fitting the print on the pattern. The bosses and ribs are next inserted in the two halves and held by riveting. The inside of the box should be given two or three coats of shellac in which soap-stone has been mixed, sanding each coat down lightly before applying the next. This will give a finish that does not hold the sand and is very lasting; the soap-stone also fills any of the pores or cracks in the metal.

In using the box, the two halves are clamped together by means of a C-clamp, and the core rammed up. One of the best core plates for this kind of a core is a stove lid, being just about the right size for the ordinary piston core. Upon inverting and unclamping, the two halves of the box are readily drawn off to the side, and if carefully done there is not even a seam to be detected along the side of the core.

Some foundries do not use a cope on their piston molds when the pistons are made in this manner. About four pistons are usually cast in a flask with a common pouring gate and weights set on the cores. One of the best methods, however, is to have individual cast iron flasks of the proper size for each piston. The advantage is that these can be readily rammed up on the bench, using the minimum amount of sand, and being easily handled. Should it be desired to use a cope, one can be rammed up on a flat board. The metal is poured alongside the tapered print as shown on the pattern. In many foundries, this method is also used for cylinder heads as well as for small engine bases. While the core work is increased slightly, yet a resultant saving is obtained on the whole as well as better castings.—D. O. Barrett.



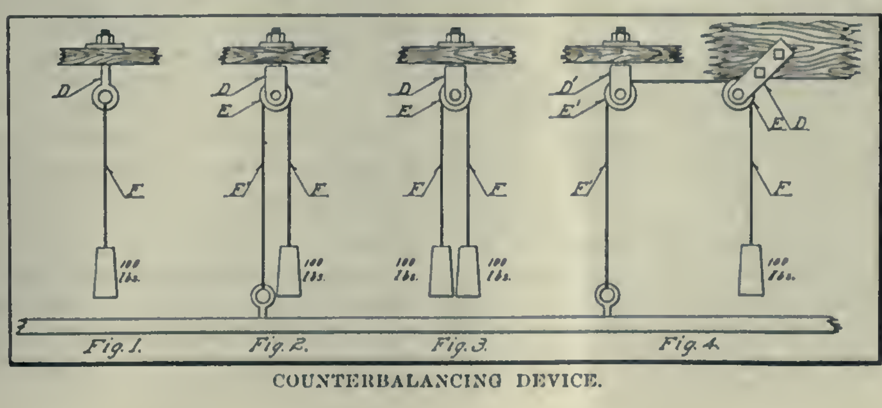
PISTON PATTERNS AND COREBOXES.

COUNTERBALANCING DEVICE.

THE sketch Fig. 5 shows an arrangement to counterbalance the overhanging weight of a heavy casting, while being milled on a small vertical milling machine. Several problems presented themselves which gave rise to considerable discussion among the men in the shop. These pertained to the strain upon the different sections of the rope, and also to the pull upon the hangers (D) and (D¹) when the weights were supported in different ways.

The operations upon the casting (A) were such that considerably over half of it would extend over the edge of the circular table (B). The auxiliary plate or table (C) was used to support the casting, which weighed about 300 lbs. When the work was secured in position, undue strain was placed upon the revolving table (B), and to overcome this, the hangers (D) and (D¹) with shafts and rollers (E), (E¹) were secured to the overhead joists, in such a position that the drops of the rope (F)and (F¹) came in the position shown, one in front and the other at the back of the machine. The weight (G) was arranged to balance the overhang of the work (A). The main interest in the foregoing is hinged upon the strain on the rope, due to the hanging weight.

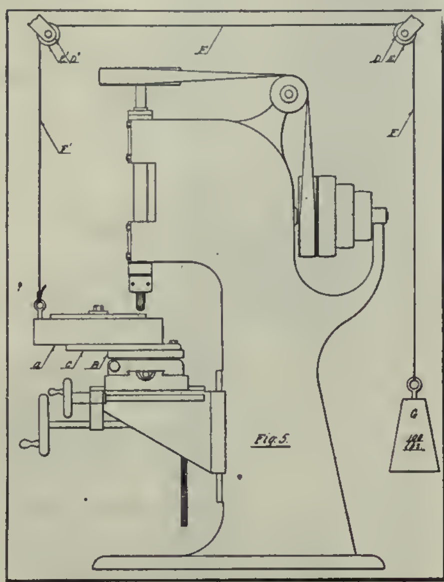
Fig. 1 shows a weight of 100 lbs. hanging on a rope (F) from an eye-bolt (D), secured to the floor above. It appears quite clear that there is a pull of 100 lbs. on the rope, and also on the eye-bolts. In Fig. 2, the rope passes freely over a pulley in the fork-bolt (D). A weight of 100 lbs. hangs on one end



COUNTERBALANCING DEVICE.

(F) of the rope, and the other end (F^1) is secured to an eye-bolt in the floor. Just here the difference of opinion arose. In my estimation, there is a pull or tension of 100 lbs. throughout the full length of the rope, but a pull of 200 lbs. on the fork-bolt (D). In Fig. 3, the results are the same, the hanging weight taking the place of the eye-bolt in the floor. Fig. 4 shows the arrangement of the rope and pulleys as illustrated in the sketch Fig. 5.

While my opinion is that there is a pull or tension of 100 lbs. throughout



COUNTERBALANCING DEVICE.

the entire length of the rope, others contended that the tension on the horizontal section of the rope between the two pulleys (E) and (E^1) was greater, or the equivalent of the pull on (F) plus the pull on (F^1). This difference of opinion was also in evidence regarding Fig. 2 and 3.

Another problem that came under discussion was the arrangement of the hangers (D) and (D^1) on the joists. As the pull, in my opinion, is equal horizontally and vertically, the hangers should be in the position (D), Fig. 4, or at an angle of 45 degrees. Opinions of readers would be much appreciated.—J. H. R.

THE UTILIZATION OF A BY-PRODUCT—EXHAUST STEAM.

At this time when increased efficiency and reduction of power costs are vital considerations in connection with the operation of manufacturing plants, it might be well to call to mind in a general way some of the many methods for effecting appreciable economies by the utilization of the exhaust steam which is usually available as a by-product. This whole matter assumes greater significance when it is remembered that from 80 per cent. to 90 per cent. of the heat imparted to the feed water in the boiler is present in the exhaust steam after passing through the engine cylinder. The foregoing statement may be checked up by assuming a typical case.

Typical Case.

Take, for example, a medium-sized plant, using automatic non-condensing engines, which consume, say, 25 pounds of steam per i.h.p. at 100 lbs. gauge pressure. Reference to a steam table will show that 1,157 heat units must be added in the boiler to the feed water at 60 deg. to produce one pound of steam at the pressure named. Hence, 25 lbs. of steam will require the addition of 28,925 heat units. When the steam is admitted to the engine, it is (1) turned into useful work; (2) dissipated through radiation losses, drips, etc.; or (3) swept out with the exhaust steam.

The heat involved in the first operation may be easily calculated; the losses experienced in the second operation can be closely estimated; while the difference between the sum of the heat consumed in these two operations and the total heat carried in the steam will, of course, represent the heat available in the exhaust. The first calculation may be made as follows:

Since one heat unit equals 778 foot pounds of work, by dividing this 778 ft. lbs. into 33,000 ft. lbs. per min. per h.p., we get 42 heat units required per h.p. per minute. Multiplying this 42 heat units by 60 minutes, we get 2,520 heat units per hour consumed in developing one horse-power of work in the engine. Radiation losses may be estimated conservatively at from 5 to 10 per cent. of the total heat of the steam, and adding this radiation loss to the heat consumed in the engine, we find that but 16 to 19 per cent. of the heat developed in the boiler to produce one h.p. of steam, or 28,925 heat units, has been expended in passing through the engine. It is, therefore, apparent that approximately 80 per cent. to 85 per cent. of the heat developed in the boilers at the expense of coal and labor is available for use in many plants in the form of exhaust steam. With these figures in mind there can be no doubt as to the advisability, or, in fact, the necessity of utilizing this exhaust steam, and the question resolves itself into securing the most efficient and economical conservation of this heat.

Before considering, however, the various methods for utilizing this exhaust steam, it is essential that mention be made of means for ridding it of what has in the past proved to be the greatest obstacle against its general use—that is, the elimination of lubricating oil carried in the steam during its passage through the engine cylinders. If this oil is allowed to remain in the steam, even when it does not come into actual contact with the substance being heated, as, for instance, in heating coils, closed or tubular heaters, etc., the accumulation of grease on the heating surfaces greatly reduces the heat transferring efficiency of same. The presence of oil also renders the condensation from such coils unfit for use unless purified of the oily emulsion. In localities where water is of poor quality, or is expensive, the loss of this otherwise pure condensation is quite serious, especially when it is considered that the drips from a 100 h.p. closed heater will amount in a ten-hour run to approximately four to five thousand pounds of pure water. Where the exhaust steam is brought into direct contact with the substances being heated, such as in heating feed water in open heaters, it is absolutely necessary that this steam be free from oil contamination.—Wilbert Sailer.

BRONZE PLATING SOLUTIONS CONTAINING TIN.

A TRUE bronze consists of copper and tin, and one would naturally think that these two metals should be used in making up a bronze plating solution. This idea, however, is wrong, and it is rare indeed to find a plater who has ever used tin in a bronze solution. The necessary bronze color can be obtained by the use of copper and zinc, and it is these two metals that are so extensively used in bronze plating. The objections to the use of tin in making up a bronze plating solution are as follows:—

1.—The solution containing tin is more difficult to maintain than one containing zinc.

2.—Tin is far more costly than zinc.

3.—As far as known, it is very difficult to obtain as good a bronze color with the tin, although theoretically it should present no difficulties. The color usually obtained by the use of tin is not as good a bronze color as it is when zinc is used.

The difficulty of obtaining a bronze color is singular for the reason that the alloy of the two metals is the true bronze color. Those who desire to try the tin, can dissolve some tin salts in cyanide and add to a good cyanide copper solution until it plates a bronze. As there is no objection to the use of zinc in a bronze solution and it is cheap, the employment of tin is not required.—Brass World.

DEVELOPMENTS IN MACHINERY

A Record of New and Improved Machinery Tending Towards Higher Quality and Economical Production in the Machine Shop, Blacksmith Shop or Planing Mill.

LEA-SIMPLEX COLD METAL SAW.

THE following are among the outstanding features of what is commercially known as the No. 15 Lea-Simplex Cold Metal Saw, built by the Lea Equipment Co., Philadelphia, Pa.

The frame is cast in one piece and heavily ribbed to procure rigidity. It is provided with three bearings to carry the main drive shaft and the trunnions of the swing arm. All bearings are of liberal proportions and provided with bushings.

The top of the frame serves as work table. It has three T. Slots and a number of pin holes for the fastening and setting of the clamping blocks or of the stock itself, such as structural shapes, etc. The rear edge of the work table is protected with a wearing strip of steel.

The swing arm consists of a strong and rigid casting suspended at three points only. This three-point suspension relieves the bearings of side thrust. The swing arm carries at one end two trunnions which rest in bearings forming part of the frame. Its other end is supported at one point only through the teeth of an accurately cut quadrant which engages a worm that raises and lowers the swing arm. This worm when raising the arm advances the blade with an absolutely uniform motion.

The saw arbor bearing is bushed and extra long to obtain rigidity. Removable plates are fastened to the side arm to guide the blade and prevent loss of alignment. These guides are made of tool steel and ground to a perfect fit, and their temper is drawn sufficiently to prevent injury to the blade. An improved device permits ready adjustment for wear. Inside the swing arm casting the spindle is located which drives the blade.

LEA-SIMPLEX COLD CUTTING-OFF SAW.

The bottom of the frame casting is designed to serve as a receptacle or tank for the cutting compound. At one side of the frame a pad is provided to which a motor support can be bolted in case the saw is to be driven by a motor and which replaces the bracket carrying tight and loose pulleys required for belt drive. The pulleys are placed below the surface of the work table, which allows the unrestricted use of the whole table, an advantage especially appreciated when long stock is to be sawed off at an angle.

The drive consists of a sprocket which engages with radial slots in the blade, the sprocket being fastened to the end of a spindle made of crucible steel. It runs in bronze bearings. A bevel gear is mounted on the other end, through which the blade is driven from the main drive shaft. The sprocket has a tapered bore to fit the conical end of the spindle, and is keyed in place and clamped with nut and washer. Both spindle and sprocket are ground to insure perfect contact and interchangeability. Guide plates protect the blade from side thrust and buckling at the point where the power is transmitted from the sprocket.

The sprocket is made of special chrome nickel-steel, which, after treatment, has a tensile strength of about 250,000 lbs. and an elastic limit of 225,000 lbs. per square inch. The sprocket teeth are planed to a form which gives best wearing qualities, and the sprockets when finished are treated and hardened to insure uniform hardness and long life.

The blade is of either 15 in., 18 in., 21 in. or 24 in. diameter, according to the size of the machine, and 5-32 in. to 3-16 in. thick. The arbor hole is $1\frac{1}{4}$ in. or $1\frac{1}{2}$ in. in diameter, while the saw teeth have a pitch from $\frac{1}{4}$ in. to $\frac{7}{8}$ in. Standard blades are furnished in high carbon crucible steel, special blades in vanadium steel or high speed steel, and have every other tooth beveled to prevent the chips from freezing to the blade.

The lubricant is contained in a tank, which forms part of the base of the machine. It is large enough, not only to give the pump an ample supply to draw from, but also to prevent loss and waste from spilling or splashing over if a piece of material cut off should accidentally drop into it. A rotary pump, driven through gears from the feed shaft is located in the tank at the front of the machine. It is of substantial construction, and operates indefinitely without attention. A system of pipes carries the lubricant to the cutting edge of the blade. The nozzle, on the end of a flexible tube, can be adjusted to deliver the lubricant at the proper point of the blade.

The feed mechanism consists of a vertical feed shaft carrying a large worm and two spiral gears with necessary clutch for feed and return and of a control rod operating the clutch. The worm engages the quadrant fastened to the swing arm, moving it up or down, thus feeding the saw blade or returning it. The worm is driven in one direction or the other according to the position of the clutch, engaging either the lower gears for the feed or the upper set for the return. The feed shaft has two babbitted guide bearings on top and bottom and rests on a roller thrust bearing. The control rod is moved up or down manually by a lever which throws handle on its upper end or automatically by an adjustable dog and tripping device. It also carries a lever to throw the clutch. By moving the handle into the proper position, the blade is either fed upward, downward or not fed at all. The automatic control is operated through a lug on the swing arm casting when it comes into contact with an adjustable dog on the control rod. The position of the dog is adjusted to suit the length of feed necessary to complete the cut of the work in hand. When lug and dog come in contact, a tripping device located at the bottom of the control rod is released, which, at the will of the operator, either returns the blade automatically or throws the feed out altogether. The return is geared in such a ratio that it is very rapid, thus adding another timesaving feature.

The feed is regulated by means of the well-known Sellers disc principle; the whole mechanism being contained in a separate box at the front of the machine, close to the operator. The mechanism consists of a lower and an upper shaft controlling the feed and the return respectively, and of a set of friction discs with indicator. The power required to feed the saw blade is transmitted from the main drive shaft to the upper shaft by sprockets and a heavy roller chain, which latter is located under the work table. It then passes from the upper shaft to the lower shaft through four friction discs. Feed regulation is obtained by changing the relative position of these discs to each other. This is accomplished by turning the ball crank on the top of the box. The exact feed per minute with which the blade is cutting is shown by a graduated indicator rod, in plain sight of the operator on the top of the box. The knob on the end of the horizontal shaft permits to regulate the friction between the discs to obtain a positive feed as required by the hardness of the stock to be cut. If at any time the cutting resistance becomes too heavy for the feed, then the friction discs will slip, and the blade will not be fed further. The feed box is so constructed that cutting compound, even if it should leak in, cannot affect its operation. All shafts run in brass bushed bearings and every part is easily accessible for lubrication.

The yoke and clamping mechanism consists of a heavy iron casting, a clamping screw and suitable blocks fastened to the table. The yoke is provided with a large slot which permits shifting of the screw parallel with the blade, to quickly adjust the stock to the blade. The screw carries on the top a hand-wheel with detachable lever for quick operation, and the upper clamp block at its lower end.

The latter, made of steel, is fastened to the screw and can be swiveled at any angle. It has a 120 degree crotch for holding large stock and a 90 degree crotch for small stock. The lower clamp blocks consist of two separate castings, the sides of which have such shape that by reversing them either square or round stock can be securely held. By making these lower clamp blocks separate they can be placed in any position on the work table, and by making them in two parts the stock can be brought very close to the table.

An adjustable gauge is attached to the yoke casting. It consists of a rod carrying a cast iron arm. By moving this arm into the desired position and clamping it in place with a thumb screw, any number of pieces of equal length can be sawed off without further measuring. It is only necessary to advance the stock as far as the arm will allow.

Belt-driven machines are furnished with tight and loose pulleys and are driven direct from the line shaft. No countershaft is required. A belt shifter is provided, and arranged in such a manner that its handle is conveniently located at the front of the machine, close to all other operating handles. The operator never has to leave his position to start or stop the saw.

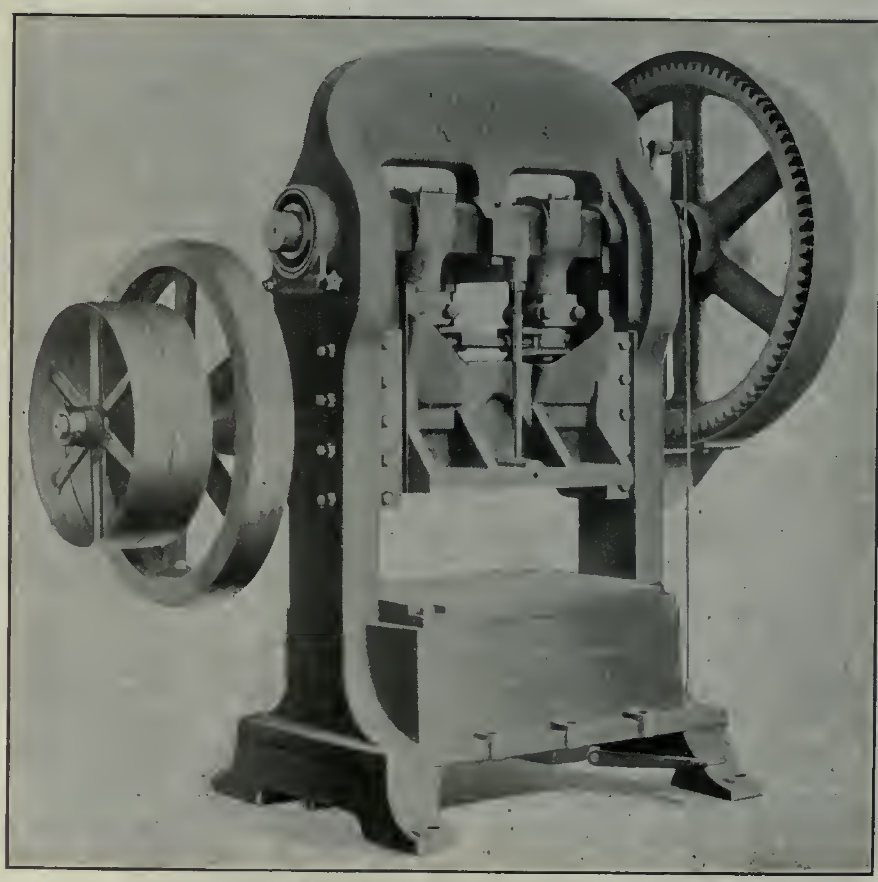
Saws are often installed in such places that it is impossible to drive them from a line shaft. In such cases they must be equipped with a motor drive. All Lea Simplex saws are provided with planed pads to which a motor support can be bolted, if it is required at any future time. In order to change the machine from belt to motor drive, it is only necessary to procure the support, motor and transmission, which may be either a set of gears or sprockets with silent chain. The chain drive is strongly recommended in preference to gearing, as it is practically noiseless and will give long service. If the machine is to be used not only for sawing of hard tool steel, but also for cutting of soft structural shapes, then a motor-driven machine should be used, because a variable speed motor will give the most economical speeds for each kind of material.

The No. 15 Lea-Simplex Machine will cut 5 in. round stock, 4½ in. square stock, 9 in. I beams on flat, and will also make angle cuts up to 55 degrees on smaller stock. The floor space of belt-driven machine is 31 in. by 46 in.; of motor-driven machine, 31 in. by 53 in.; and the speed of drive pulley is 285 R.P.M.

DOUBLE CRANK, GEARED POWER PRESS.

THE double crank geared power press described and illustrated is one of a line of presses recently produced by the Cleveland Machine & Mfg. Co., Cleveland, Ohio.

In designing this machine, the manu-



DOUBLE CRANK GEARED POWER PRESS.

facturers took pains to eliminate all the known weak points in other presses of this type. The weak part of the housing, which was around the shaft opening, has been reinforced 25 per cent. The arch and bed are of extra deep section, and the slide is reinforced to do away with practically all deflection when using large forming or embossing dies. Knock-out rods are attached to the centre bearing cap for ejecting formed and drawn parts from the upper die. When desired, the beds of these presses are fitted with a drawing attachment, which is also used as a knock-out device for ejecting work from blanking and forming dies.

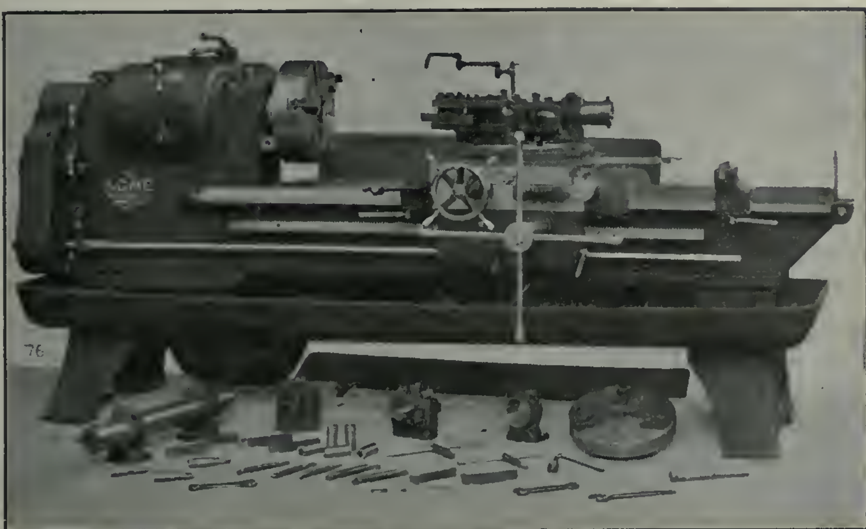
These presses are fitted with either a positive steel clutch or a powerful multiple disc friction clutch, which may be either automatic or hand operated. The friction clutches are used principally on the larger presses or those having long strokes. For the sake of safety the gear and pinion are fully covered with a cast iron guard.

These presses are being built in nine sizes, ranging from a 3-inch shaft to a 12-inch shaft, and each size is built in several widths. Patterns are constructed so that many dimensions of these presses, such as stroke of slide, distance from bed to slide, or die space, opening in bed, etc., can be varied to meet special requirements at only slight additional cost. The principal dimensions of the machine shown are as follows:—

Weight, 28,000 pounds; distance between uprights, 49 in.; bed area, front to back by right to left, 36 in. x 48 in.; opening in bed, front to back by right to left, 24 in. x 38 in.; area of slide flange, front to back by right to left, 26 in. x 39 in.; stroke of slide, 6 in.; distance bed to slide, stroke and adjustment up, 17 in.; adjustment of slide, 3 in.; proportion of gearing, 7½ to 1; diameter of large gear, 60 in.; weight of balance wheel, 1,400 pounds; size of pulleys, 36 in. x 6 in.; capacity, 175 tons pressure.

ACME COMBINATION FLAT TURRET LATHE.

THE Acme combination flat turret lathe is the product of the Acme Machine Tool Co., Cincinnati, Ohio. As implied, these tools are adaptable to both bar and chucking work. The maximum capacity for the former is ¾ in. diameter x 36 in. long, while all classes of chucking work up to 16 in. diameter can be machined. The actual swing over the bed is 22 inches.

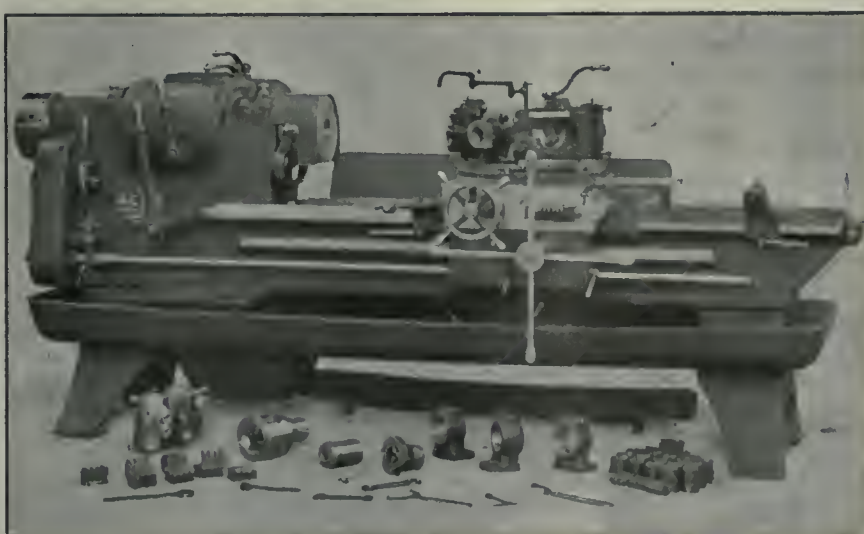


CINCINNATI ACME FLAT TURRET LATHE WITH CHUCKING EQUIPMENT.

The bed is of a heavy deep box section, strongly ribbed to withstand all cutting strains when the maximum pulling power of the geared head is being utilized. The bed rests on a three point bearing. The pan blocks and tank are cast solid with the pan, which is made unusually deep to provide for a large quantity of chips. A perforated cover serves as a strainer, allowing the oil to drain back into the tank. A geared pump is furnished, which provides an ample supply of oil when the machine is running in either direction.

The geared head is simple in construction, and a maximum pulling power, together with nine different speeds, is acquired with a minimum number of gears continuously running in an oil bath. The different speeds ranging from 14 to 285 r.p.m. are obtained quickly and without noise, and are controlled by the two levers conveniently located at the front of the head. The spindle is made of high carbon hammered crucible steel forged from the solid, and is mounted in renewable bearings of babbitt. By means of a double cone friction operated by a lever at the front of the head the spindle can be instantly started, stopped and reversed. Rigidity, accuracy and simplicity are insured by casting the head solid with the bed. A 12 in. single pulley running at a constant speed of 600 r.p.m. and driven by a 3½ in. belt delivers power for all turning, boring and forming operations.

The positive automatic chuck is especially designed to insure holding the work accurately and with great gripping power. It can be opened and closed while the machine is running by the long lever at front of head. The distinctive features are that the work does not have end motion while chuck is being closed, thus producing accurate shoulder lengths. The master-collet parts that hold the jaws are held fast against the closing ring, which prevents all dirt and chips from getting between them. This prolongs to a great extent the accuracy of the chuck. The jaws do not collapse, and extremely short work can be held without tilting. For variations in dia-



CINCINNATI ACME FLAT TURRET LATHE WITH BAR EQUIPMENT.

meters, adjustment for 1--6 in. larger or smaller is provided. The jaws can be easily removed without dismantling the chuck. To insure accuracy and long life, all working parts of the automatic chuck are hardened and ground, and the chuck jaws are hardened, but not ground unless specially ordered.

The simplex roller feed is extremely simple in design and operation, as only one adjustment is necessary. By adjusting the jaws to the size of stock with a spanner wrench, then slightly releasing them, the rollers will have the proper tension. The roller feed is operated by the same lever that actuates the automatic chuck.

The cross sliding turret revolves on a hardened and ground stem of large diameter, and is automatically locked into position by a hardened and ground tool steel taper plunger placed directly underneath the cutting tool. This plunger works in hardened ground taper bushings let into the solid turret and as near the outer edge as practicable. The turret is further held down at the extreme outer edge with circular clamps. Oiling arrangement is provided so that oil can be fed to each individual tool. The cross slide moves on a long narrow dove-tail guide, with wide flat bearing surfaces on either side, and has an adjustable taper jib to compensate for wear. It is also provided with an adjustable hardened centre stop. The cross feed, which is operated by hand or power in both directions, is furnished with a large graduated pilot hand wheel to facilitate in forming operations. The saddle has a continuous bearing on two exceptionally heavy vees on the bed, and carries the swinging stock stop, which is adjustable, attached to the front.

The stops are especially noteworthy because of their simple and fool-proof construction, positive action, and convenience in operation. Twelve longitudinal stops are provided, one independent stop for each turret face, and six auxiliary stops which are operated by the knob on the front of the saddle, which can be used in any combination desired with the independent stops. The cross feed has eight stops controlled by the knob on the front of the slide, which can be used to advantage in conjunction with the large graduated pilot hand wheel. These stops are arranged to trip the power feed in either direction. When doing chuck work as many as seven different lengths can be turned without indexing the turret. Safety stops are provided to trip the power feeds in all directions. All working parts are protected from dirt and chips, which adds to the accuracy and output of the machine. The feeds for both the longitudinal and cross movement are of the geared type. All feed changes are instantly obtainable by the lower lever, and can be reversed through the upper lever, both located on the front of headstock. All feeds can be changed and reversed without stopping the machine.

The reinforced apron is of the double wall construction, and all shafts and studs are supported on both ends. It is securely bolted and keyed to the bottom of the saddle, and provides a double bearing support for the feed rod which is driven by a knuckle joint coupling at head end. An adequate oiling system, which adds considerably to the life of the machine, has been amply provided for.

Centralized control, one of the very important features, has been well provided for. The time between operations has been reduced to a minimum by placing the various levers, such as the longiturinal turnstile, cross feed hand wheel, cross and longitudinal stops and power feed levers, binder handle and stock stop directly in front of the operator.

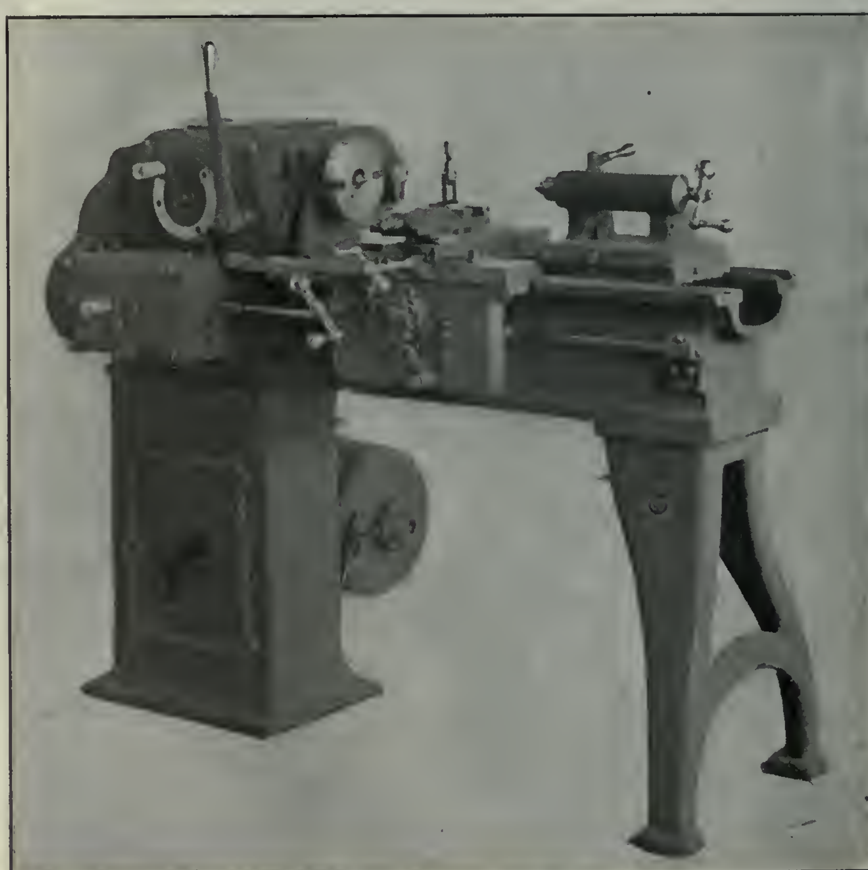
HIGH SPEED RAPID PRODUCTION LATHE.

THE illustration and description refer to a new type high speed rapid production lathe, designed and brought out by the Conover-Overcamp Machine & Tool Co., Dayton, Ohio, for the the Fort Wayne electric plant of the General Electric Co., and is something new in the matter of lathe design. It is of the single pulley drive, all-geared-head type, arranged for either motor drive or drive through countershaft; it has four all-geared mechanical speeds, and the main drive is a friction drive in the headstock. Through this friction the lathe can be stopped, started and reversed without stopping, starting or reversing the motor. The operator has full control of the machine at all times.

The machine, a 12 in. swing by 4½ ft. bed, was designed to meet a maximum spindle speed of 1,500 r.p.m., which is a high speed for an all-geared-head lathe, and under test this spindle was run up to a maximum of 3,500 r.p.m. At this speed the gears ran perfectly quiet and the machine could be stopped, started and reversed through the friction drive in the head.

The lubricant of the lathe has been laid out, and is obtained through the splash system, whereby all the journals in the head and the main spindle bearings are oiled through a felt system, wiping the bearings continually and keeping them well lubricated.

The vertical lever operates the stop, start and reverse, and the radius plate with the holes indexed operates with four changes of speeds. These changes can be made while the machine is running at its maximum speed. The lathe has four changes of positive geared feed. The apron is of standard type. This lathe is also built for small high speed chucking work as well as for regular turning.



HIGH SPEED RAPID PRODUCTION LATHE.

GENERAL INDUSTRIAL GOSSIP

A Review of Developments in the Industrial World which Make for Higher Degree Achievement along Economic Lines Through Concentration and Conservation of Effort

EXTINGUISHING FIRES IN OILS AND VOLATILE LIQUIDS.*

Edw. A. Barrier.

THE extinguishing of fires in oils and in most of the volatile liquids has always been a difficult problem, and where fires of this kind occur, the results are frequently very disastrous. Our most common extinguishing agent, water, works rather unsatisfactorily upon the majority of such fires, but it is still the only one available where heroic measures are required. Comparatively recently, however, there have been two or three other materials introduced for use as extinguishers which have shown some promise for dealing with these fires, and it is the purpose of this paper to discuss these materials and the conditions under which they prove the most efficient.

Not all fires in volatile liquids are difficult to handle with water. When the liquid is miscible with water, this extinguishing agent can be successfully used. Examples of this kind are denatured alcohol, wood alcohol, grain alcohol, acetone, etc. Where the liquid is not miscible with water, little or no effect is produced except to wash the burning liquid out of the building where it may be completely consumed, or, if the quantity of oil is small, possibly to extinguish the fire by the brute cooling effect of a large quantity of water sprayed upon the fire. Soda and acid extinguishers are somewhat more effective than pure water, but even they fail under most conditions. The various grenades containing salt solutions which were formerly extensively exploited are, of course, practically worthless.

The only principles that can be made use of in extinguishing fires in volatile oils are:—(a) To form a blanket either of gas or of solid material over the burning liquid which will exclude the oxygen of the air; or, (b)—To dilute the burning liquid with a non-inflammable extinguishing agent which is miscible with it.

Sawdust and Bicarbonate of Soda.

To the blanketing type of extinguishers belongs sawdust. Paradoxical as it may seem, ordinary sawdust is an excellent extinguishing agent for certain volatile liquids, especially those of a viscous nature. A considerable number of experiments were conducted in the fall of 1912 by the inspection department of the Associated Factory Mutual Fire Insurance Companies, in the extinguishing of fires in lacquer and gasoline in tanks with sawdust, and the results were surprisingly satisfactory.

The liquids were placed in three tanks 30 in. long, 12 in. wide and 16 in. deep; 48 in. long, 14 in. wide and 16 in. deep; and 60 in. long, 30 in. wide and 16 in. deep. The sawdust was applied with a long-handled, light but substantially built snow shovel, having a blade of considerable area. In every case the fires were extinguished readily, especially in the two smaller tanks, which were about as large as any ordinarily employed for lacquer in manufacturing establishments.

The efficiency of the sawdust is undoubtedly due to its blanketing action in floating for a time upon the surface of the liquid and excluding the oxygen of the air. Its efficiency is greater on viscous liquids than on thin liquids, since it floats more readily on the former than on the latter. The sawdust itself is not easily ignited and when it does become ignited it burns without flame. The burning embers have not a sufficiently high temperature to reignite the liquid.

The character of the sawdust, whether from soft wood or hard wood, appears to be of little or no importance, and the amount of moisture contained in it is apparently not a factor, so that the drying out of sawdust when kept in manufacturing establishments for a time would not effect the efficiency.

It was found that the admixture of sodium bicarbonate greatly increased the efficiency of the sawdust, as shown both by the shortened time and the decreased amount of material necessary to extinguish the fires. A further advantage of the addition of bicarbonate of soda is that it decreases the possible danger resulting from the presence of sawdust in manufacturing plants, since it would be difficult, if not impossible, to ignite the mixture by a carelessly thrown match or any other ready source of ignition.

Although the efficiency of the sawdust is greatest on viscous liquids such as lacquers, heavy oils, Japan, waxes, etc., in the tests referred to, fires were extinguished in gasoline contained in the smallest tank and also when spread upon the ground. In larger tanks, the sawdust or bicarbonate mixture does not work so well since the sawdust sinks before the whole surface can be covered, whereupon the exposed liquid reignites.

Carbon Tetrachloride.

In recent years carbon tetrachloride has received considerable attention as a fire-extinguishing agent. This is due largely to the activity of certain manufacturers of fire extinguishers which use liquids, the basis of which is carbon tetrachloride. This substance is a water white liquid and possesses when pure a rather agreeable odor somewhat similar to chloroform. A considerable proportion of the commercial article upon the market, however, contains sulphur impurities which impart a disagreeable odor to the liquid. The substance is quite heavy, its specific gravity being 1.632 at 32 deg. fahr. It is non-inflammable, non-explosive, and is readily miscible with oils, waxes, japan, etc. When mixed with inflammable liquids it renders them non-inflammable provided a sufficient quantity is added. Its vapor is heavy, the specific gravity being about five and one-half times that of air, consequently it settles very rapidly. As an extinguishing agent, it dilutes the inflammable liquid rendering it non-inflammable, or at least less inflammable, and it forms a blanket of gas or vapor over the burning liquid which excludes the oxygen of the air.

Although this paper is confined to a discussion of extinguishing fires in oils and volatile liquids, it may not be out of place to mention that the claims made by certain manufacturers producing extinguishers which use liquids, the basis of which is carbon tetrachloride, are grossly exaggerated. These preparations none of which is more efficient than carbon tetrachloride, are not the equivalent of the ordinary water extinguishers for general use on such materials as cotton, wood, paper, oily waste, etc.

On volatile liquids, oils, etc., carbon tetrachloride has, however, shown very satisfactory results under some conditions, but the readiness with which a fire can be extinguished with it depends to a considerable extent upon the skill of the operator and the nature of the fire. In tank fires the length of time that the liquid has been burning is an important factor, and in such cases where the sides of the tank become heated the only way in which the fire can be extinguished is to squirt the liquid forcibly at the sides. If the carbon tetrachloride is squirted directly into the liquid it is much more difficult, if not impossible, to extinguish the fire.

The height of the liquid in the tank is also a very important factor. Where the

*From a paper read recently before the American Society of Mechanical Engineers.

liquid is low the sides form a pocket which retains the vapor and aids considerably in smothering the blaze. When the tank is nearly full, however, this condition does not exist, and it is then very difficult, if not impossible, to extinguish a fire in a highly volatile liquid, such as gasoline; only the most skilled operators are successful in these cases. The size of the tank or the extent of the fire if upon the floor is, as would be expected, of considerable importance. In tanks larger than about 28 in. by 12 in. more than one extinguisher and operator working at a time are necessary to extinguish a fire in such materials as gasoline. In one test where a tank 60 in. by 30 in. was used no less than seven operators were necessary, and even then it was only with the greatest difficulty that the fire was put out.

All of the above remarks apply to carbon tetrachloride in the ordinary one-quart extinguisher as generally sold. It is probable that a large extinguisher which could throw a large stream would prove more efficient, but on account of the great weight of carbon tetrachloride such an extinguisher would have to be specially designed to make it readily portable by mounting on a truck or some similar means. Expelling the liquid by means of a hand-pumping arrangement would probably be unsatisfactory, and it would therefore be necessary to force it out in some other way.

A few systems have recently been installed in which an elevated tank containing carbon tetrachloride was connected with automatic sprinklers or perforated pipes located in hazardous rooms where volatile and inflammable liquids are in use. So far as is known none of these systems have as yet been called upon to extinguish a fire, but there appears to be no reason why such a system should not provide excellent protection in special cases. In such systems it would be necessary to consider the safety of the workmen and furnish ready means of escape, since carbon tetrachloride is an anesthetic and where thoroughly sprayed through the air as from an automatic sprinkler it would probably produce rapid results.

The Fumes Feature.

The nature and effect of the fumes given off when carbon tetrachloride is thrown upon a fire is a subject which has received a great deal of discussion. When the liquid comes in contact with a fire the vapor is partly decomposed resulting in the evolution of a considerable quantity of black smoke which is undoubtedly finely divided carbon. Pungent gases are also produced which appear to be mostly hydrochloric acid with possibly a small amount of chlorine. Since carbon tetrachloride contains no hydrogen from which hydrochloric acid could be formed this substance must be produced by the action of chlorine on the gases arising from the burning material or upon the moisture of the air.

The fumes of carbon tetrachloride although of a very pungent nature do not produce any permanent injury under ordinary conditions where the operator can make his escape after he has inhaled all that he can stand, but they are a distinct handicap in fighting a fire and are one of the objectionable features to carbon tetrachloride as a general fire extinguishing agent. In large rooms or where a small quantity of carbon tetrachloride is sufficient to extinguish a fire the gases are, of course, less objectionable.

Frothy Mixtures.

Another method of extinguishing fires in oils and volatile liquids which has recently been proposed and experimented with is that of using frothy mixtures. The idea seems like a very promising one and the tests which have been thus far reported indicate very satisfactory results. The idea was originated and has been developed in Germany. So far as is known no experiments have been conducted in this country.

The process consists essentially in causing two liquids to mix in a tank where foam is produced. The tank is made air-tight and sufficiently strong to permit of the foam being forced out by carbon dioxide under pressure, and the foam is conveyed to the fire by means of a line of hose. The exact nature of the liquids has not been disclosed, but one of them probably consists of a sodium carbonate solution containing froth-forming ingredients such as glue or casein and the other an alum solution. The two on coming together generate carbon dioxide which produces froth. This froth is reported to be quite stiff and to shrink in volume but a comparatively small amount even after a period of half an hour.

A number of tests were conducted in the winter of 1912 in Germany; some of them on a considerable scale. In one case as much as 5 tons of crude naphtha in a tank was involved, and in another an area of 1,300 sq. ft. of burning tar was used. In all cases the results were reported satisfactory, the fires being extinguished in a short time.

The frothy mixture undoubtedly owes its efficiency to its blanketing action in settling upon the surface of the burning liquid, thus excluding the oxygen of the air, and to the fact that the bubbles of liquid contain carbon dioxide which upon bursting produce an atmosphere in which combustion cannot take place.

According to the latest reports, the matter is still in an experimental stage, various details regarding the form of apparatus, most efficient pressure, and design of nozzles being under consideration; but from what has already been done it would appear that the idea is a very promising one, and that this method of extinguishing fires in oils and volatile liquids will prove to be by far the most efficient of any that has as yet been suggested.

State Department Revenues.

Revenue of the State Department from the Incorporation of Companies in the first seven months of the fiscal year shows a decrease in comparison with the corresponding period. The total was $140,165, as against $157,187 in the seven months last year. The fees were unusually large last year on account, not only of the number of companies, but the unusual capitalization of several of them. The revenue is based upon the capital.

Public Works Estimates.

Estimates totalling fifty million dollars have been prepared by the Public Works Department. This is about two million in excess of last year. The budget will have to be revised by the Treasury Board. No new works are provided for, but those in progress already are so extensive and require such a large outlay, that it is difficult to reduce the amount. Harbor improvements, dredging and the construction of drydocks provide the principal items.

Stratford, Ont., Factories.

With the largest membership in its history, 150, the Board of Trade on November 21, met in annual session, heard encouraging reports and adjourned to the Windsor Hotel for dinner. Two of the city's largest manufacturers and veteran Board of Trade workers were the principal speakers at the banquet, Messrs. George McLagan and W. J. Mooney. The newly-elected officers are: President, A. C. McLeod; vice-president, H. W. Strudley; Secretary, F. A. Copus; auditor, G. L. McHattie.

The report of the council of the Board expressed gratification at the ten per cent. increase in population during the year, from 15,076 to 16,425; a creditable increase in factory output and the addition of new industries, such as the Farquharson-Gifford upholstered furniture factory, the Classic Furniture Co., makers of bedroom furniture; the Whitesides Paper Box factory, and the taking over and doubling of the Mill Building Co.'s plant by the Canadian Allis-Chalmers Co. The capital invested in factories is now $3,972,500; there are 2,570 male employees and 606 female. During the year $1,573,211 was paid in wages, and the factory output was $6,359,936. The building permits totalled $299,431.

ENAMELING OR COATING STEEL AND IRON WITH GLASS.*

By Raymond F. Nailler.

BEFORE going into the technology of this art, it will be interesting to note its history in a general way: where it originated and how it was brought down to the present age. The covering of burnt earthenware, porcelain and some metals with a crude enamel took place about the same time as the discovery of glass. Since the time when man first enameled metals, especially gold, silver and copper, he began to be interested in the problems connected with artistic enamels.

Colored enamel earthenware has been found in the ruins of Thebes. In the ruins of a great many other ancient cities of Egypt enameled or glass-covered brickwork has also been discovered. That the Egyptians knew how to adorn silver vessels with enamel pictures has been recorded by Pliny the Elder. From Egypt the enameling arts were transferred to Greece and thence to Rome, and some historians maintain that the enameling art came to Italy by Arabia, Spain and the Balearic Islands, and through Roman expeditions the art passed into England, France and Germany. In the museum at Oxford is an enamel ornament which was found in Somerset, the inscription of which dates to the time of Alfred the Great.

Early Art Enameling.

As a particular example of early art enameling let us briefly consider the so-called enamel painting. Two periods may here be distinguished: The first, known as the "old Limoges style," was characteristic of the time of Francis I. (1515-1547). The enamel plate, generally made of copper, was covered with a dark enamel coat. After firing, figures, weaker or stronger according to the relief desired, were put on with white enamel and the impression of bas-relief thereby brought about. The second period of enamel painting began a generation after the first. This is the so-called period of the "miniature style" which was introduced about the middle of the sixteenth century. It was brought to an extraordinary state of perfection by Jean Petitot (1607-1690).

As the demand for the artistic enamels of antiquity and the middle ages increased, so the enameling of gold and silver gave way to that of copper vessels, and from this point, if we except the somewhat scattered industry of miniature painting on boxes, such as jewel cases, etc., the absolute decline of the enameling art is to be recorded.

In the nineteenth century, which it must be conceded brought one of the most important of Europe's social, educational, and technical revolutions, the enameling business came into great significance and eventually became the enameling industry of to-day. The commercial introduction of iron and steel made it possible to re-apply the half-forgotten art of enameling iron utensils. In the history of the development of enameling or the modern industrial technology of iron enameling, we are able to speak of two periods with regard to the iron materials employed, viz., of the original enameling of cast iron exclusively and the later application to sheet metal.

The Word Enamel.

Before considering the technology of any particular type of enamel it will be well to consider the meaning conveyed by the word enamel. If the present-day enamel be briefly and scientifically designated as a boro-sodium-potassium-aluminum silicate generally colored by metallic oxides, then the following definition given by Popelin deserves to be quoted since this, notwithstanding its length, may be described as most clear and comprehensive: "Enamel is a glass fusible at a low temperature and usually compounded of borates and silicates. This mixture, originally colorless, combines with the greatest ease with metallic oxides under the influence of a pyrotechnic operation, thereby acquiring various colors according to the nature of the oxide which the enameler can vary at will."

Commercial Enamel.

The uses to which the general class of ceramic compounds known as enamel is put are varied. We have noted that enamels are used for artistic or decorative purposes. Parallel to this use we may classify a far more important type of enamels as "commercial," and it is with this type of enamel that we are to concern ourselves.

The first class of commercial enamels is that used on cast iron and this classification includes the field of sanitary equipment together with various forms of cast-iron kettles and similar pieces of engineering apparatus. The enameling of sheet steel may be taken as the second class of commercial enamels. The most familiar division of this class includes cooking ware enamels. The various forms of so-called agate and granite ware as well as the single colors are made by enameling sheet-steel forms. The second class of steel enameling which has more recently come into industrial importance is the manufacture of enamel signs, and the third field includes the manufacture of heavy equipment for large scale food preparation, the dairy industries, and general chemical operations. The apparatus in this last case may take the form of tanks, kettles, evaporators, pipes, etc.

In outlining the technology of the enameling industries as a whole we may include to a certain extent all of the above commercial classes, certain details of which are varied to meet the conditions of cast iron and various types of sheet-steel products. The outline following, however, is characteristic of all classes.

General Process Characteristics.

The first step to be considered is the preparation of the enamel. The purity of the raw materials to be used in the compounding of an enamel must be certain and in the cases where materials can vary in strength the actual analysis of the substance must be known to assure proper results. In many cases the secret of an enamel lies in its formula and so the compounding of the batches is very carefully guarded, only a person of responsibility having charge of weighing the ingredients. The various materials are generally kept in bins which are numbered, the person in charge of the mixing having the formula stated in terms of these numbers. The properly weighed batch is thoroughly mixed, this being accomplished either by shoveling carefully on a specially prepared floor or by mechanical mixing by means of a rotating agitator.

The product of the mixing room is taken to the smelter in which the various ingredients are fused together in the form of a mass having the characteristics of glass. The furnace in which this operation takes place is a special reverberatory furnace similar to that used in the puddling process in the manufacture of wrought iron. The coal is placed on a grate at the front end of the furnace and the burning gases pass over the bridge wall, strike the roof, and are deflected against the batch. The first change which may be noted in the smelter is the driving off of the water from the borax which produces a swelling up of the mixture. The fluxing materials then melt down and as the heating is continued, dissolve the more refractory constituents.

If the batch is properly stirred and the temperature of the furnace carefully regulated, the product of this operation is a clear transparent glass containing no particles of unfused material. When a test of the fusion comes up to this standard the furnace is tapped and as the liquid glass flows into a tank of cold water it is broken up by the chilling action of the water, the result being a thorough granulation of the product. The material thus prepared is known as "frit."

The next step in the preparation of the enamel involves grinding the frit to a fineness at which it can be applied to

*From a paper read recently before the American Society of Mechanical Engineers.

the surface of the metal. The mill here used is the ordinary pebble mill lined with porcelain brick and containing very hard flint pebbles. In the cast-iron industry two general processes are used, the dry and the wet, in sheet-steel work only the wet. In the first case the frit is ground dry, the pulverized enamel being sprinkled on the hot cast-iron piece. In the wet process a certain percentage of pure white clay is placed in the mill with the frit and a certain definite amount of distilled water.

When certain grades of enamel are to be manufactured various compounds are also added here to aid in producing desired colors, gloss and opacity. An instance of this is the addition of tin oxide in the mill in the production of white cooking utensil enamels. The fineness to which the enamel is ground depends upon the particular use to which it is to be put, manner of application and other factors. In the wet process the essential feature is that it be fine enough to remain suspended in the water assisted by the clay and the so-called "vehicles" mentioned below.

Material to be Enameled.

At this point we may take up the consideration of the construction and preparation of the material to which the enamel is to be applied. Cast-iron enamels are applied to castings of the desired shape. In the case of cooking ware enamels the shapes are constructed by pressing and spinning. For heavier equipment such as jacketed kettles the apparatus is constructed by riveting or preferably welding the sheet steel in the desired form. The selection of the steel with a view to its chemical analysis is of prime importance. A reliable specification reads as follows:

Sulphur	below 0.040
Phosphorus	below 0.030
Manganese	about 0.40
Silicon	about 0.010
Carbon	about 0.10

The steel must necessarily be free from laminations or other mechanical imperfections.

With reference to the construction of heavy apparatus the sheet ranges from 3-16 in. to 3/8 in. in thickness. Two general methods of construction are in use:

The first involves the formation of unit sections fitted with flanges. These sections are enemaled separately, bolted together at the flanges and the desired apparatus so constructed. The preferable practice, however, is to construct the apparatus in one piece by means of autogenous welding, thus avoiding the use of gaskets or other packing materials in erection. That the enamel may properly adhere to the surface of the metal, the latter must be free from dirt or scale, and in the case of welded joints the welds must have a preliminary grinding to reduce the roughness. The entire surface of the apparatus is then cleaned by pickling or sand blasting, the latter process being altogether used in cleaning large apparatus. As the crude ware leaves the sand blast it has a roughened, clean, metallic surface, and is in the proper condition to receive the enamel.

Enamel Application.

Before applying the enamel to the metallic surface it is prepared by a process known as "setting up." This involves the addition of certain chemicals to the enamel as taken from the mill, the function of this addition being to assist the clay in holding the enamel particles in suspension. Substances so added are termed "vehicles." At this stage the enamel must be diluted with distilled water to the proper consistency for application.

In applying the enamel to the metallic surface, three general methods are in use:

The first, applicable to small pieces only, is known as "dipping," the piece being dipped into the enamel, the excess of which is shaken off, leaving a thin coating on the metal. The second method, known as "slushing," involves pouring the prepared enamel over the surface and allowing it to drain. The third method, which is the principal one used on larger apparatus, involves spraying the finely ground enamel on the metallic surface by means of the compressed air atomizer.

Furnace Type.

Preliminary to the consideration of firing the enamel we may review the types of furnaces in use. The first type is known as the muffle furnace, and involves the use of a large fire clay oven externally heated by means of coal, gas or other fuel. The apparatus to be fired is placed on suitable supports in this muffle. The other type of furnace is known as the direct fire furnace, in which the heat from the fire is taken up by the walls of the firing chamber and radiated to the apparatus placed within the chamber on suitable racks. This general class of furnace has two special divisions in that, on the one hand, the piece is rotated within the furnace, while on the other hand, the piece is allowed to remain stationary. For small work the muffle is in general use, but for the production of large apparatus the direct-fire furnace is necessary.

At first thought, the muffle furnace may be considered to have an advantage in that the products of combustion together with the dust from the fire cannot come in contact with the enamel. Again, it may seem that a more even heat can be realized in the muffle. On the other hand, with a properly designed direct-fire furnace in which the combustion is complete before the gases reach the firing chamber no trouble is experienced due to their presence or to the dust from the fire. The use of natural gas further does away with this latter possibility.

In a furnace for firing smaller ware, the charging mechanism is a fairly simple matter, it being necessary merely to place the material in the furnace by means of a small fork operated by hand or mechanically, but in the manufacture of engineering apparatus where a single piece may weigh 3,000 to 4,000 lbs., it is necessary to have a large mechanical charging machine on which the piece may be placed outside the furnace, the arm of the machine then properly placing it in the furnace. The general design of such a machine suggests the charger used in open-hearth practice.

The apparatus to which the enamel has been properly applied is placed in the furnace which is maintained at the proper temperature. This temperature varies with the nature of the enamel and in cases of high silicon acid-proof enamels reaches in the neighborhood of 2,500 deg. Fah. The control of the burning is made possible by the changes which occur in appearance of the enameled surface as fusion takes place.

Enamel Composition.

Nothing has been said so far as to the composition of the enamel or of the number of coats applied. In general, there are two kinds of enamel, known as ground coats and cover coats. The former serves as a bond between the enamel and the steel, and the latter serves to build up the body of the enamel and presents the finished surface. In the ground coat, color is no object. Its composition is such as to render it adherent and strong. In addition to the ordinary components cobalt oxide seems to be essential to the production of adherence. The explanation of this is debatable. The cover coat is the one which forms the major part of the enamel and if definite color, opacity, etc., are objects, the necessary ingredients for their production are introduced here, assisted by mill additions as noted above.

In the manufacture of acid-proof enamel, the cover coat is essentially a high silicate and must be free from any metallic oxides, such as oxide of tin, lead, iron, etc. The piece to be enameled receives one ground coat which is burnt well into the steel at a high temperature. The cover coats may be one or two in number for ordinary enameling, but should be at least triple for acid-proof work.

(Continued in next issue.)

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PRINCIPAL CONTENTS.

IRON ORE BOUNTY PROPOSAL.

If the iron ore used in Canada, 93 per cent. of it comes from the United States. This is the figure given by the Port Arthur Board of Trade, who are endeavoring to induce the Dominion Government to give a bounty of fifty cents for every ton of iron ore mined in Northern Ontario. The figure seems rather large in view of the enormous amount that is imported into Nova Scotia from Newfoundland, and the considerable quantity imported from England when the price is low enough, but, whatever the figure, it is an indisputable fact that the amount of ore mined in Canada is almost infinitesimal. In view of the fact that an immense iron deposit has been discovered near New Hazelton, B.C., which an American mining authority says is as rich as anything yet discovered on the coast, the resolution passed by the Port Arthur Board of Trade, a copy of which has been sent to Mr. Borden, is of interest and importance to men in the iron and steel trade.

This resolution states that over 100,000,000 tons of iron ore have been proved to exist in Northern Ontario, and urges parliament to authorize the payment of a bounty of fifty cents per ton mined and smelted in Canada in the next ten years, such bounties in the aggregate not to exceed $1,000,000 in any one year. Then the demand for iron ore in Canada is comparatively small, and the supply from Michigan is too plentiful to tempt American steel concerns to come into Canada for it. The bounty as suggested by the Port Arthur Board of Trade is preferable to a protective duty, because a duty on iron ore coming into Canada would hamper still further the efforts of Canadian iron companies to make pig iron on a paying basis. It is strange that with all this ore lying hidden in Ontario it should be necessary for a Canadian Company to open mines in Venezuela. Such is the case, and the mines are supplying ore to the United States, and, we understand, are paying.

PREPARING FOR COMING BUSINESS.

NEW industries just now are as scarce as hens' teeth, and happy is the city that can find one. So scarce are they, the tendency is to do away with industrial commissions. The commissioner who can induce an American manufacturer to come to Canada at present is a good business man, and worth his salary. Many of the best and surest propositions are held up through lack of capital and business. A Hamilton newspaper stated last week that a movement was on foot to do away with the office of industrial commission because no new factories were coming in. This would be a foolish move, and bad business. Manufacturers do not turn their expert mechanics away when hard times come. Even though no orders are in, they do their utmost to find something for them to do, be it only repair work. Municipalities should try to do the same with their industrial experts. Mr. Marsh, of Hamilton, is a smart and clever business man, who, like the busy bee, will improve each shining moment. A depression like the present is an excellent time to prepare plans for the big rush of industries which is bound to come next year, and the years following. This work, like other professions, requires preparation, and if Hamilton goes to sleep for a year, she will wake up to find wheels turning elsewhere.

Talking about industries reminds us of opportunities lost by Chatham, Ont., which is doing her utmost just now to secure a large match factory. On the authority of Alderman Arnold of that city, it is related that the H. Mueller Mfg. Co., a well known American firm of brass founders, offered to build their plant in Chatham if given a bonus. The proposition was turned down because a bonus was asked. The foundry was erected in Sarnia, where they got a $40,000 bonus, and are employing three times as many men as they bargained on. We do not favor the system of bonusing, but the practice has become recognized in Ontario, and until it is forbidden by law, the bird that provides the money early, gets the worm. The Remington Arms Co. also went to Chatham to erect a factory of seven buildings in which to manufacture ammunition. For some reason or other they were allowed to get away to Windsor, where they paid a high price for a site, and are now erecting their plant.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

	Mont'l.	Tor'to.
Grey Forge, Pittsburg.	.....	$14 15
Lake Superior, charcoal, Chicago	.....	15 25
Middlesboro, No. 3	20 00	21 50
Carron, special	24 25	.....
Carron, soft	24.25	.....
Cleveland, No. 3	20 00	22 00
Clarence, No. 3	20 50	21 00
Jarrow	.....	23 50
Glengarnock	......	26 00
Michigan charcoal iron.	25 00	.....
Ferro Nickel pig iron (Soo)	.....	25 00
Victoria, No. 1	19 40	18 35
Victoria, No. 2X	19 15	18 10
Victoria No. 2 Plain	18 90	17 85

BILLETS.

	Per Gross Ton.
Bessemer billets, Pittsburgh	$20 00
Open hearth billets, Pittsburgh	20 00
Forging billets, Pittsburgh	24 00
Wire rods, Pittsburgh	25 50

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto	2.00
Steel bars, f.o.b., Toronto	2.05
Common bar iron, f.o.b., Montreal.	2.10
Steel bars, f.o.b., Montreal	2.15
Bessemer rails, heavy, at mill	1.25
Steel bars, Pittsburgh	1.25
Tank plates, Pittsburgh	1.20
Beams and angles, Pittsburgh	1.25
Steel hoops, Pittsburgh	1.45
F.O.B., Toronto Warehouse.	**Cents.**
Steel bars	2.25
Small shapes	2.35
Warehouse, Freight and Duty to Pay.	**Cents..**
Steel bars	1.80
Structural shapes	1.90
Plates	1.90

Freight, Pittsburgh to Toronto.

18 cents carload; 21 cents less carload.

IRON PIPE FITTINGS.

Canadian malleable, 40 per cent.; cast iron, 65; standard bushings, 70; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 77½; malleable, lipped unions, 65.

NAIL AND SPIKES.

Standard steel wire nails, base	$2 30	
Cut nails	$2 60	2 65
Miscellaneous wire nails	75 per cent.	
Pressed spikes, 5/8 diam., 100 lbs.	2 85	

BOILER PLATES.

	Mont'l.	Tor'to.
Plates, ¼ in., 100 lbs	.....	2 20
Heads, per 100 lbs.	2 65	2 55
Tank plates, 3-16 in	2 40	2 30
Tubes, per 100 ft., 1 inch	9 50	8 50
" " 1¼ in.	9 50	8 50
" " 1½ "	9 50	9 00
" " 1¾ "	9 50	9 00
" " 2 "	8 75	8 75
" " 2½ "	11 15	11 50
" " 3 "	12 10	12 50
" " 3½ "	14 15	14 50
" " 4 "	18 00	18 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Stove bolts	80 & 7½
Machine bolts, 3/8 and less	65 & 10
Machine bolts, 7-16	60
Blank bolts	60
Bolt ends	60
Machine screws, iron, brass	35 p.c.
Nuts, square, all sizes	4¼ per lb off
Nuts, Hexagon, all sizes	4½ per lb off
Fillister head	25 per cent.
Iron rivets	60, 10 p.c. off
Wood screws, flathead, bright	85, 10, 7½, 10 p.c. off
Wood screws, flathead, Brass	75, 10, 7½, 10 p.c. off
Wood screws, flathead, bronze	70, 10, 7½, 10 p.c. off

Milled Products.

Sq. & Hex. Head Cap Screws	65 & 10%
Sq. & Hex. Head Cap Screws	65 & 10%
Rd. & Fil. Head Cap Screws	45-10-10%
Flat & But. Head Cap Screws	40-10-10%
Finished Nuts up to 1 in	75%
Finished Nuts over 1 in	72%
Semi-Fin. Nuts up to 1 in	72%
Semi-Fin. Nuts over 1 in	72%
Studs	65%

Discounts, f.o.b., Montreal.

OLD MATERIAL.

Dealers' Buying Prices.	Mont'l.	Tor'to.
Copper, light	$10 00	$11 00
Copper, crucible	12 00	12 25
Copper, uncr'bled, heavy	11 50	11 50
Copper wire, uncr'bled.	11 00	11 50
No. 1 machine compos'n	10 50	10 75
No. 1 comps'n turnings	9 00	9 00
No. 1 wrought iron	9 00	8 00
Heavy melting steel	7 00	8 50
No. 1 machinery cast iron	13 00	12 00
New brass clippings	8 50	8 75
No. 1 brass turnings	7 25	7 50
Heavy lead	3 75	4 00
Tea lead	3 00	3 00
Scrap zinc	3 00	3 50

WROUGHT IRON PIPE.

The following are Toronto jobbers' discounts on pipe in effect from April 21, 1913:

Standard	Buttweld Black	Buttweld Gal.	Lapweld Black	Lapweld Gal.
¼, 3/8 in.	64	49	....	....
½ in	68	58	....	....
¾ to 1½	73	63	....	....
2 in.	73	63	69	59
2½ to 3 in.	73	63	72	62
3½ to 4 in.	71½	61½	70½	60½
4½ to 6 in.	....	....	71½	61½
7, 8, 10 in.	....	....	66	54
X Strong P. E.				
¼, 3/8 in	56½	46½	....	....
½ in.	64	54	....	....
¾ to 1½ in.	68	58	....	....
2 to 3 in.	69	59	....	....
2½ to 4 in.	....	....	66	56
4½ to 6 in.	....	....	64	56
7 to 8 in.	....	....	55	45
XX Strong P. E.				
½ to 2 in.	43	33	....	....
2½ to 4 in.	....	....	43	33

PRICES OF WROUGHT IRON PIPE.

Standard. Nom. Diam.	Standard. Price. per ft.	Extra Strong, Sizes Ins.	Extra Strong, Price per ft.	D. Ex. Strong, Size Ins.	D. Ex. Strong, Price per ft.
1/8in	$ .05½	1/8in	$ .12	½	$. 32
¼in	.06	¼in	.07½	¾	.35
3/8in	.06	3/8in	.07½	1	.37
½in	.08½	½in	.11	1¼	.52½
¾in	.11½	¾in	.15	1½	.65
1 in	.17½	1 in	.22	2	.91
1¼in	.23½	1½in	.30	2½	1.37
1½in	.27½	1½in	.36½	3	1.86
2 in	.37	2 in	.50½	3½	2.30
2½in	.58½	2½in	.77	4	2.76
3 in	.76½	3 in	1.03	4½	3.26
3½in	.92	3½in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4½in	1.27	4½in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.86	...	.....
7 in	2.38	7 in	3.81	...	.....
8 in	2.50	8 in	4.34	...	.....
8 in	2.88	9 in	4.90	...	.....
9 in	3.45	10 in	5.48	...	.....
10 in	3.20	....	.....	...	.....
10 in	3.50	....	.....	...	.....
10 in	4.12	....	.....	...	.....

METALS.

	Mont'l.	Tor'to.
Lake copper, carload	$16 00	$16 25
Electrolytic copper	15 25	15 75
Casting copper	15 10	15 60
Spelter	5 25	5 25
Tin	40 50	40 00
Lead	5 25	5 25
Antimony	8 50	8 50
Aluminum	21 00	21 00

SHEETS.

	Mont'l.	Tor'to.
Sheets, black, No. 28	$2.85	$2.90
Canada plates, ordinary, 52 sheets	2.80	3.00
Canada plates, all bright	4.00	4.15
Apollo brand, 10¾ oz. (American)	4.30	4.20
Queen's Head, 28 B.W...G.	4.40	4.40
Fleur-de-Lis, 28 B.W.G.	4.20	4.25
Gorbal's Best, No. 28	4.40	4.40
Viking metal, No. 28	4.40	4.40

MISCELLANEOUS.

	Cents
Putty, 100 lb. drums	$2.50
Red dry lead, 5 cwt. casks, per cwt.	6.00
Glue, French medal, per lb.	0.10
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.26
Benzine, per gal.	23½
Pure turpentine	0.60
Linseed oil, raw	0.60
Linseed oil, boiled	0.63
Plaster of Paris, per bbl.	2.10
Plumbers' Oakum, per 100 lbs.	3.25
Pure Manila rope	0.17

COKE AND COAL.

Solvay Foundry Coke	$5.95
Connellsville Foundry Coke	5.80
Yough, Steam Lump Coal	3.88
Penn. Steam Lump Coal	3.68
Best Slack	2.99

All net ton f.o.b. Toronto.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents.

Montreal, December 8, 1913.—Business is very quiet in most lines and some houses report that, after a temporary improvement, collections are again becoming hard to make. In machinery circles, trade is dull, one or two small orders from the C.P.R. being all that have been placed during the past week. Mussens, Ltd., report a fair number of enquiries. This firm have just been appointed sole agents in Canada and Newfoundland for Detrick & Harvey, Baltimore, Md.

The Dominion Bridge Company have to-day been awarded contracts for four new steel bridges for the Intercolonial Railway. The Canadian Allis-Chalmers Co. have also received orders for three bridges to be located at West River, Barney's River and French River in Nova Scotia.

Metals.

There is a fair country demand for bar iron and also for general hardware, but in the city these lines are very quiet. The same may be said of pig iron, though some enquiries for 1914 requirements have been received.

With regard to steel it is not improbable that the near future will see a rise in price, since at the present time consumption is outstripping production. Prices are consequently very firm.

Toronto, Ont., Dec. 9, 1913.—The most important point in connection with the steel trade in Canada this week is that the railways, who have not been buying freely of late, are coming into the market for bars and railway fastenings. This should help the steel business, just as the demand by the railways for machine tools is keeping machinery agents from going to sleep.

Apart from that, the only other feature just now is that most concerns are closed down or about to close down for stock-taking. It is getting too near Christmas to sell much steel, and most agents have their men at home. The latter will be closed up too next week for stock-taking. The coming three weeks are usually the slackest of the year.

Reinforcing steel is very dull just now, only small lots being in demand. Pig iron is selling moderately well. Business in wire has been very fair; the same with nails. The demand for rivets, screws, etc., is keeping up, enabling plants to run at about six days a week. Most manufacturing concerns throughout the province have either laid off a large percentage of their men, or have decreased the number of working hours so as to keep all their hands at work. In Canada, labor is not so easily secured as to allow it to depart as soon as hard times comes along. The Moffat-Irving Steel Co., who have recently put an electric steel furnace into operation, have retained all their men, and have sufficient work to keep them going. Unlike some concerns, the work is coming to them. Prices have not changed. Steel shapes are quoted at $2.40 for warehouse on small pick-up orders, and $2.35 for larger orders.

Machine Tools.

In the machine tool business, it is one continual fight to get orders to make the getting profitable. The Kelsey Wheel Co., who were to have purchased machine tools several weeks ago, have now decided to bring the old machinery from their Detroit plant across the river to their new Windsor plant, and to purchase new machinery for the parent plant. Second-hand machinery can be imported cheaper. This company, however, does not expect to be making wheels until February. The Massey-Harris Co. have been buying milling machines this week.

Orders are being placed by the contractors on the new Welland Canal, both for machine tools, and for contractors' machinery.

Metals.

A large metal dealer when asked this week regarding business, said: "You can say business has emigrated. It is the worst we have known in fifteen years. Manufacturers are looking sick. Men who a year ago talked $5,000, can't now talk five tons. Some of the big concerns who buy as a rule in very large quantities, will not now even take what they ordered." He said quite a lot more that was equally pessimistic.

St. John, N.B., Dec. 6, 1913.—An immense factory is to be built at Coldbrook besides those already mentioned in these columns as projected or already completed there. The contract will probably be awarded next week. Tenders have been called and the work of construction is to commence as soon as the successful tenderer is decided upon. The Canada Nail & Wire Co., Ltd., for whom the factory is to be erected, is planning to have the works completed within three months and to start turning out their product in the spring. The new company has secured a site four acres in extent, facing Rothesay Avenue and just beyond the Ford automobile works. The plant will have a frontage of 175 feet on the avenue and a depth of 50 feet, with an L running towards the rear of similar dimensions. The main parts of the building will be of most modern design, one storey in height, with a two storey section at the corner, where the wings intersect, the upper storey to be used for a suite of offices.

The foundations are to be of piling surmounted by reinforced concrete and the superstructure will be of brick. A brick boiler house will be located at the rear of the front portion and in the angle formed by the L, entirely separate from the main buildings. The order has been given for the machinery for the new plant and the work of construction is to be hastened in order to have the plant ready when the machinery arrives. The company has been organized for the manufacture of horseshoe nails and horseshoe calks for both of which they feel there is a big field in Canada, there being only one other concern in the

Dominion producing the latter article. G. W. Wilson, of St. John, is the architect in charge of the plant.

Ex-Senator N. M. Jones, general manager of the Partington Pulp and Paper Co. interviewed Mayor Frink this week and asked for an extension of time by the city in the company's removal of the machinery of the Mispec pulp mill purchased by them. Fair progress has been made in the work of removal, but many of the larger pieces will require more time, and an extension beyond January 1 is asked. It is thought the demand will be granted.

Work on the construction of the western extension of the Aroostook Valley railway will be commenced in the spring. The surveys have been completed. This railway company has been incorporated under the name of the St. John & Quebec Railway. The line will connect with the St. John Valley Railway near Centreville. Premier Fleming said this week that the third section of the Valley Railway amounting to about 120 miles would be finished next year, construction being resumed in the spring.

There is a possibility of a branch plant being established in St. John for the manufacture of the Bolinder Marine Oil Engine. Captain Linde, representative of the Swedish Steel and Importing Co., of Montreal, was in St. John this week with a view to their introduction. He said he expected to establish an assembling plant in this city which would employ quite a number of men and be reckoned as an important industry.

Oxy-Hydrogen Torch.

A contemporary describes a new process for using the oxy-hydrogen torch under water for cutting metals, as in dismantling sunken ships. The torch is fitted with a bell-like head, which works in conjunction with a blast of compressed air. The system was recently tested in Kiel Harbour in a depth of 5 m. of water, when an iron case of 100 mm. by 20 mm. was cut through, a cut of 10 cm. length being made within 30 seconds. A piece of iron 60 mm. square was cut through in the same time, while in a sheet 20 mm. thick, a cut 30 cm. long was made in 1½ minutes. The pressure under which the oxy-hydrogen mixture of the cutting flame issues must be considerably increased, and the whole of the combustible gas must be consumed, and not only a part, as is the case with the oxy-acetylene torch.

Zinc Depositing.

A description of a German method of securing adherent deposits of zinc in galvanizing is given in "Mineral Resources of the United States for 1912." After steeping in sulphuric acid, the iron is placed in a solution of mercuric chloride and then heated, resulting in a decomposition of the mercuric chloride and precipitation of metallic mercury, which forms an amalgam of iron on the surface. The iron is then plunged into a zinc bath heated to 500 deg., where it remains three minutes. Microscopic investigation shows that the zinc penetrates into the pores of the iron, and in case a portion of the coating is worn or broken off, the iron does not rust, the presence of sufficient zinc in the pores preventing corrosion. The mercury is, of course, lost.

Concreting in Deep Water.

In depositing concrete in deep water through a funnel, the most difficult part of the operation, says the Engineering Record, is filling the tube at the start. As is well known, unless the tube is sealed in some way the cement will wash out during the downward passage and leave only a pile of stone and sand. This waste of concrete may in the case of a 12 in. tube, 50 ft. long amount to more than 1 cubic yard. A simple but effective method of preventing this waste was described at a recent meeting of the American Railway Bridge and Building Association at Montreal. A 7 in. or 8 in. layer of wood shavings is first inserted and is covered with about 1 in. of cement. This forms a plug, and as the concrete is dumped on top, the buoyancy of the plug and resistance of the column of water underneath prevent the first concrete from falling rapidly enough to wash out the cement; from then on, the concrete itself serves as a seal.

Fatigue or Negligence, Which?

Sir Charles P. Davidson, Chief Justice of the Superior Court of Quebec, will be called upon to decide whether a wire-drawer employed by the Steel Company of Canada in their Montreal plant who sustained injuries to his arm, was guilty of gross negligence or whether the accident was caused through unsteadiness due to fatigue. The man, whose name is Jack Miller, has entered action against the company under the Workmen's Compensation Act of Quebec. He was in charge of three drums at the wire plant, and, while at work, lost his balance, and in trying to save himself from falling, got his hand caught in one of the drums. His forearm was badly mangled. The Steel Company denies liability on the ground of negligence of the man. Miller denies negligence, and states that he had to remove the reels of wire as they were drawn, weighing from 150 to 200 lbs., and it could not be construed as negligence if at times he became tired and unsteady on his feet. The fatigue he argues, was due to the arduous work he was called upon to perform.

What is an abattoir?

Is an abattoir a manufacturing plant? The question is one of importance to the Dominion Abattoir, Ltd., London, Ont. When the city annexed some adjoining territory, it was agreed that new factories would be exempt from assessment, and taxed only on the value of the land. The owners of the Dominion Abattoir take the ground that theirs is a manufacturing plant, while the assessment department argue that it is assessable the same as a wholesale house. The matter was laid over for further consideration. We presume the decision will be determined by the extent of the business done by this company. If they simply prepare meat for consumption, they can hardly be considered manufacturers, whereas if, like many packers, they prepare fertilizers, lard, and the like, they might reasonably be considered as manufacturers.

A Tax on Machinery.

Towns and cities all over Canada have been thinking hard for the last few years on the question of how to induce manufacturers to locate within their boundaries. The Province of Saskatchewan is just now curbing a prevailing tendency by prohibiting the granting of bonuses to manufacturers. Quebec Province is also about to put power into the hands of municipalities to keep industries away, though this is not really the intention. The idea is to give municipalities power to tax all machinery within their limits as a means of raising revenue. It seems as though this will have the effect of keeping manufacturers away from Quebec to a greater or lesser extent, and certainly they will not be over-anxious to purchase new machinery and thus increase their taxation. This matter comes under the revision of the Municipal Code of Quebec, now contemplated by the Legislature. Several members, notably Lieut.-Col. Smart, member for Westmount, consider the measure opposed to the interests of the Province. Col. Smart thinks business is already taxed enough in Quebec. There are many mills and factories, he says, where the building is nothing more than a shell for the expensive machinery used. Every encouragement should be given to manufacturers to establish new factories in Quebec instead of driving them away, says the Colonel. A similar tax proposed three years ago was defeated.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Engineering

Saskatoon, Sask.—The Metal Shingle and Siding Co., Ltd., Preston, Ont., will establish a branch here.

Toronto, Ont.—The Bawden Machine Co., Sterling Rd., have completed, and are now operating their foundry.

Port Arthur, Ont.—The Western Drydock Co. are now operating their new foundry which was built during the summer.

Ottawa, Ont.—The Campbell Steel and Iron Works, Ltd., Carling Ave, have started to build a new blacksmith shop, of steel construction.

Fort William, Ont.—The Dominion Iron & Steel Co. who own land on Island No. 1, will build a warehouse and dock here it is believed.

Maisonneuve, Que.—The Provincial government has given $500,000 and the city a site towards a technical school, which may be erected next year.

Dundas, Ont.— The Pratt & Whitney Co. will erect a new hardening room and a store-room, the whole building being 50 x 30 feet, and of steel construction.

Montreal, Que.—The Grand Trunk Railway System is in the market for new equipment, including 110 passenger coaches, 500 flat cars and 500 stock cars.

Regina, Sask.—The Regina Foundry Co., per C. B. Springstein, is one of many Regina firms who have asked the city to lend them a considerable sum of money.

Midland, Ont.—The Midland Malleable Iron Co., who were recently granted a large bonus by the ratepayers, are calling tenders on the construction of a railway siding.

Bedford, Que.—The entire plant of the Bedford Co., makers of axes, scythes, saws, etc., was burned to the ground on December 1. The loss of $75,000 is covered by insurance.

Winnipeg, Man.—Henry Birks & Sons, who will erect a large jewelery factory here, state that they will not be ready to supply information regarding equipment for six months yet.

Dundas, Ont.—The Canadian Abrasive Wheel Co., incorporated at Toronto last summer to manufacture abrasive materials, will erect their plant in the east end of the town next spring.

Niagara Falls, Ont. — The Oneida Community Co., who make iron traps and various other lines, are planning an extension to their plant for the coming year.

Galt, Ont.—The Galt Knife Co., Ltd., will erect a single storey factory, 45 x 140 feet here. Thomas Vair and his son Wardlaw Vair, formerly of the Peter Hay Knife Works, are the promoters.

Montreal, Que.—At the auction of the plant of the Star Iron Co., Ltd., of Beauharnois, Que., no sale was effected. The liquidators are trying to dispose of the plant privately.

Port Arthur, Ont.—A site has been purchased by a company who have a patented process for brazing iron, and who will establish a plant here to employ 40 hands.

Toronto, Ont.—R. C. Bartlett, 16 Spencer Avenue, has organized the Canadian Bartlett Automobile Co., Ltd., with $1,000,000 capital, to manufacture automobiles. He may build a plant here.

Kaslo, B.C.—James A. McIlwee & Sons, Denver, Col., who have secured the contract for driving ten miles of tunnel through Rogers' Pass, are erecting construction camps at both ends to start work January 1.

Cobalt, Ont.—One-half of the 80-stamp battery of the new Northern Customs Concentrator will begin operations on Dec. 15. This machinery was built in record time by the Wabi Iron Works, New Liskeard, Ont.

Hamilton, Ont.—The Hamilton By-Products Coke Ovens Co. who will erect a $1,000,000 plant here, the Ontario Pipe Line Co., and the Hamilton Gaslight Co., are reported all to be under the contract of the United Gas and Fuel Co.

Medicine Hat, Alta.—The Canada Cement Co. have erected a new machine shop at Plant No. 14, but have ceased construction work for the winter. Plans will be prepared for the remainder of the plant. The Hunt Engineering Co. have charge.

Toronto, Ont.—The Roofers Supply Co. will move their warehouse from the foot of Bay Street, to the old Pease Foundry at the corner of Shaw and Dupont Streets, where they have made additions and alterations. New equipment, consisting of shears, etc., will be installed.

Windsor, Ont.—The Parsons Motor Co. of Canada, Ltd., are contemplating the erection of a motor car plant here.

Hespeler, Ont.—The Canada Machinery Corporation will in future make all their woodworking machinery here. Their plant at Preston, known as the Ballantyne Foundry, will be closed, and machine tools moved to Hespeler.

Woodstock, Ont.—The Wayne Oil Tank & Pump Co. have rented the old Pneumatic Hammer building, which they will use as an assembling shop until their new plant is erected. Plans and tenders for the latter are in the hands of contractors.

St. Catharines, Ont.—The Confederation Construction Co. who have the contract for No. 3 Section of the new Welland Canal, have just completed the erection of two large machine shops. Excavations are being made for concrete beds on which to hold the machines.

Berlin, Ont.—The Buffalo Forge Co. of Montreal and Buffalo, who are erecting a large plant here for the manufacture of blowers, etc., have not yet prepared specifications for machine tools and other equipment required.

Toronto, Ont.—Rock and Power Machinery Ltd., who were incorporated recently to carry on business in Ontario as machinery agents, have opened offices in the King Edward Hotel, Toronto. Phil H. Moore, lately a mining salesman in the employ of Allis-Chalmers, Ltd., has been appointed manager.

Niagara Falls, Ont.—The Pollard Manufacturing Co. are making progress with the erection of their plant. The walls are up, and steel is on the ground, but they are not ready yet to purchase equipment. They make stone-cutting machinery and other lines, and are very busy.

London, Ont.—W. Metcalf, of the Metcalf Agencies, 252 Dundas St., maker of rope-making machinery, would welcome data regarding the supply of special cast iron and malleable iron, and general castings.

Vancouver, B.C.—Two weeks ago it was announced that the Hewitts, of Seattle, Wash., would erect blast furnaces in or near to Vancouver. It is understood that they will be supplied with iron ore by the North Pacific Co., of Prince Rupert, B.C., who control an immense iron deposit recently discovered near New Hazelton.

Coldbrook, N.B.—The Canada Nail & Wire Co., Ltd., have called tenders for the erection of a one-storey plant, 175 x 50, to be completed in three months. Horse shoe nails and calks will be manufactured. Equipment will be required for the boiler house, and some machine tools, though it is understood that the principal machinery has been purchased. Garnet W. Wilson, St. John, N.B., is the architect.

Windsor, Ont.—The Remington Arms-Union Metallic Cartridge Co., Bridgeport, Conn., are erecting a plant at Windsor, consisting of seven one-storey buildings, of brick and steel, with saw-tooth roof. One building is already completed. The equipment will consist of the most modern automatic machinery, with safety devices and fire protective apparatus. The principal product will be shot gun ammunition.

Exeter, Ont.—The Exeter Mfg. Co., Ltd., have been incorporated at Toronto, capital $20,000, to take over as a going concern the business of founders and machinists heretofore carried on under the name of James Murray & Son, at Exeter, and all the assets and liabilities of that firm; to carry on the business of manufacturers of bells, roadmaking tools and machinery, concrete block and other moulding machinery, cast iron culvert and other pipes, wheelbarrows, pumps and other hardware specialties. Incorporators: Ralph Y. Struble, Frank B. Zieg, etc., Fredericktown, Ohio.

Toronto, Ont.—John T. Hepburn, Ltd., has been incorporated at Toronto with a capital of $200,000 to manufacture cranes, brick machinery and other implements and machinery, and to carry on the businesses of tool makers, brass founders, metal workers, boiler makers, iron masters, iron founders, engineers, builders and machinists in all their respective branches; to acquire also the foundry and machine shop business now carried on by John T. Hepburn in Toronto. Incorporators: John F. Boland, Frederic J. Boland, etc., Toronto. It is understood that extensions to the plant will not be made until a future date.

Windsor, Ont.—The Ontario Steel Products Co., Ltd., a merger of several of the spring and axle makers in Ontario, have purchased land on which they will erect a spring factory early next year. The new equipment required will consist of a full supply of modern spring-making machinery, machine tools for various kinds of work including the making of dies, etc. The first building will be 175 by 60 ft., designed to permit of extension. The plant will be a branch of the Dowsley Spring & Axle Co., Chatham, Ont., and will be operated by natural gas. W. T. Sampson, general manager, Gananoque, Ont.

Vancouver, B.C.—It is understood that Yarrow & Co., the Glasgow shipbuilders, have bought the plant of the Wallace Shipyards, Ltd., at North Vancouver, as the nucleus of a larger plant. The latter are not yet prepared to make any statement, but it is believed that the deal has been accomplished. The Wallace shipyards consist chiefly of repairing slips.

Electrical

Galt, Ont.—Four-globe ornamental lights are desired by residents on Water Street south.

Edmonton, Alta.—White way lighting will be undertaken by the city as soon as the ordinary street lighting is completed.

Chapleau, Ont.—The Chapleau Light and Power Co. is installing a large new generator in its plant.

Forest, Ont.—The ratepayers have granted the council authority to spend $6,000 on extensions to the electric light system.

Verdun, Que.— The Verdun council are asking the Quebec Legislature for power to construct conduits for electric wires.

Sydney, N.S.—The Cape Breton Electric Co. are installing a 400 k.w. motor generator set in their Sydney power house.

Richmond Hill, Ont.—The town will spend $4,000 on a municipal electric light system if the by-law for this is passed on January 5.

Tilbury, Ont.—The ratepayers will vote on a by-law to provide $10,000 for a distributing plant under a contract proposed to be made with the Ontario Hydro-Electric Commission.

Toronto, Ont.—The Hydro-Electric Commission of Ontario is making tests of a new German street light which, it is claimed, will sell very cheap.

Battleford, Sask.—The town of Battleford recently contracted with North Battleford for a year's supply of electrical energy at the rate of 5c per kilowatt hour.

Weston, Ont.—Weston Electric Light and Waterworks Commission are interested in the proposed extension of the Hydro-Electric line to the villages of Thistletown, Woodbridge and Bolton. Weston is the nearest distributing station, and the current may be supplied from there.

Fort William, Ont.—The council will shortly submit by-laws to the ratepayers authorizing the expenditure of $115,000 for electric lighting purposes, and $238,000 on the street railway.

Moose Jaw, Sask.—The Light and Power Committee have instructed the electrical superintendent to secure two 100 k.w. transformers from the Canadian Maloney Electric Co., Windsor, Ont., at $938.

Saskatoon, Sask.—The city offers to construct a line from the power house to Factoria, and supply current to manufacture at $2.20 per k.w. if an agreement be made to use $14,000 worth annually.

Sudbury, Ont.—The ratepayers on December voted in favor of a ten-year agreement with the Wahnapitae Power Co.; also to expend $9,844 on an electric light system extension, and $25,000 for sewers.

Brandon, Man.—The power rights on the Assiniboine and Little Saskatchewan rivers for about fifty miles on either side of this city have been reserved for municipal uses by the Dominion Government.

Hamilton, Ont.—Manager Sifton, of the Hydro department, says the city will do the work necessary to supply Barton Township with power, but the Commission will pay the initial cost, estimated at $11,267.

Owen Sound, Ont.—T. H. Hogg and O. G. Flanaghan, Hydro-Electric engineers, have recently performed preliminary work at Eugenia Falls, and confirm the report that work will go ahead immediately.

St. Catharines, Ont.—The City Council has given final reading to a by-law providing for the expenditure of $116,000 for the establishment of a Hydro-Electric system in the city capable of supplying 2,000 h.p.

Walkerville, Ont.—The ratepayers have voted in favor of making an agreement with the Ontario Hydro-Electric Commission for a supply of power, and also voted in favor of purchasing a distributing station, sub-stations and equipment for power plant.

Morrisburg, Ont.—The corporation have entered action for the return of the power plant now supplying the Hydro-Electric Power Commission of Ontario. In 1912 it was placed in the hands of J. L. Sharkey, who was to re-open his steel sheet plant. Later it is alleged, he made an assignment of the power plant to the Rapids Co., who took it to supply the Hydro-Electric Commission with power.

Niagara Falls, Ont.—Merchants have offered to pay half the cost if the city will light the streets with lamps after the decorative illuminating system adopted in Niagara Falls, N.Y.

Chatham, Ont.—The City Council have offered the Chatham Gas Co. $190,000 for their electrical department. The company asked $192,000. If the offer is refused, a municipal plant will be erected by the Hydro-Electric Commission. Mr. Adam Beck recommends that the company be offered $410,000 for both their gas and electric plants.

Building Notes

Chatham, Ont.—The Chatham Match Co., an American concern, will erect a factory here, costing $80,000, if given certain concessions.

Toronto, Ont.—J. B. MacLean has secured permission from the city to build a five-storey brick and stone office building on the corner of University Ave. and Edward Street. It will cost $40,000.

Wood-Working

London, Ont.—The Hon. Adam Beck is contemplating the erection of a box factory at Iroquois Falls, Ont.

Dundas, Ont.—Jones Bros., makers of barbers' supplies and other furniture, will make additions to their plant.

Cumberland, B.C.—The sawmill of the Canadian Collieries Ltd., owned by Mackenzie and Mann interests, Toronto, will be rebuilt.

Port Arthur, Ont.—Heintzman & Co., piano makers, Toronto, announce that they will probably erect a plant here before long.

Burnaby, B.C.—The erection of a new shingle mill at Royal Oak, having a capacity of 60,000 shingles per day, is to be started within the next few days, according to C. C. Harrigan, manager of the concern.

General Industrial

Coquitlam, B.C.—The. B.C.. Grinnell glove factory has begun operations.

Owen Sound, Ont.—Taylor & Pringle will build a two-storey 35 x 45 ft. addition to their vinegar factory.

Toronto, Ont.—Lever Bros., makers of Sunlight soap, have secured a permit to erect a $25,000 addition to their plant on Front street.

Prince Albert, B.C.—The Scottish-American Oil & Fertilizing Co. have prepared plans for a fertilizing plant.

Guelph, Ont. — The Dominion Linen Mills Co. have asked the city to guarantee their bonds to the extent of $120,000.

Niagara Falls, Ont.—The council have promised to guarantee the bonds of a new industry to the extent of $100,000.

Sarnia, Ont.—The Imperial Oil Co. is making plans for the erection of new buildings, stills, docks, and a number of tanks.

Eureka, N.S.—The Nova Scotia Underwear Co., has increased its preferred stock by $50,000, and will instal new machinery.

Fort William, Ont.—The Armour Grain Co., of New Jersey, have taken out a license to do business in Ontario, and are expected to build an elevator here.

Woodstock, Ont.—On December 4, the Oxford Evaporator Co. plant at Currie's Crossing was destroyed by fire, with a loss of between $10,000 and $15,000.

Lethbridge, Alta.—The Royal Collieries were put up for sale by Sherriff Young on December 1. J. N. Ritchie bid $100,000, but the reserve bid was $158,000, so there was no sale.

Montreal, Que.—The Empire Cotton Mills at Welland, Ont., will be bought out by Smart Woods, Ltd. A meeting of the shareholders of the latter is called for December 22 to sanction the proposed purchase.

Vancouver, B.C.—The Cannery of the Jervis Inlet Canning Co., at Bargain Bay, 55 miles north of here, is reported destroyed by fire. The insurance is between $100,000 and $150,000. C. Cliff, Burnaby, president.

Bridgeburg, Ont.—The International Specialty Co., with capital of $200,000, will take over the Edwards-Jackson Prestoline concern, and erect a plant in the spring. Wm. G. Edwards, president, Wm. Wharton, secretary.

Brantford, Ont.—The United Rubber Mfg. & Reclaiming Co., with a capital of $350,000, have secured a site of 3½ acres and will erect a building 250 x 60 feet. A start will be made early in the new year. 100 men will be employed. R. G. Wotten, General Manager.

Ottawa, Ont.—Fixed assessment on general taxes will be granted to the United Drug Co., i.e., $15,000 for 20 years. This company is to locate a factory employing about 150 hands and costing $125,000, on Loretta and Laurel Streets and Breeze Hill Avenue.

Saskatoon, Sask.—Milling machinery costing $50,000, is being installed in the new plant of the Northland Milling Co. at Factoria. J. M. Frailich, an expert from Kansas City, is doing the work.

New Incorporations

Maloney Electric Co., of Canada, Ltd., incorporated at Ottawa, capital $300,000, to take over the business of the Canadian Maloney Electric Co., Ltd. Incorporators: Richmond W. Hart, Armand Chenier, etc., Toronto.

The Champion Brick & Tile Co., Ltd., incorporated at Toronto, capital $75,000, to manufacture and deal in brick, tile and other such product, at Kingsville, Ont. Incorporators: Darius Wigle, Reuben M. Wright, etc., Kingsville, Ont.

The Royal Motor Supply Co., Ltd., incorporated at Toronto, capital $50,000, to acquire as a going concern the business of the Royal Motor Supply Co., dealers in gasoline, oils, etc., at Toronto. Incorporators: Waldon Lawr, Vera Hughes, etc., Toronto.

Marburg Bros., Ltd., incorporated at Toronto, capital $40,000, to carry on the business of engineers, manufacturers, and dealers in all kinds of machines, machinery and appliances, movable and stationary, etc., at Toronto. Incorporators: Theodore H. Marburg, Otto Veit, etc., Toronto.

Wellington Comox Co., Ltd., incorporated at Ottawa, capital $500,000, to lay out and operate coal mines, iron mines, collieries, smelters, furnaces, mills, plant and machinery for the refining or treatment of coal and ores of every description, shops, mills and works for the manufacture, treatment or handling of coal or coke or any product or by-product thereof, at Toronto. Incorporators: Gerard Ruel, Reginald H. Montague, etc., Toronto.

Contracts Awarded

Peterboro', Ont.—The William Hamilton Co. have been awarded a contract to supply waterwheels and other machinery for a power house, by the Charlton-Englehart Power Co., Englehart, Ont.

Montreal, Que.—The Southern Counties Railway Co. have ordered six passenger coaches 55 ft. 2 ins. long, two trailer and two express cars, from the National Steel Car Co., Hamilton. The Canadian Westinghouse Co. will supply the electrical equipment. The Canadian General Electric Co. have been awarded contract for electrical equipment for the Rougemont power house.

Victoria, B.C.— The contract for the construction of the telephone line for the Sooke waterworks scheme has been awarded to Thomas Watson, whose figure of $10,650 was the lowest of the six bids received.

Victoria, B.C.—The contract for the construction of steel trestles on the Sooke Lake pipe line has been awarded by the city to the Canada North-West Steel Co., whose bid was approximately $25,000.

Ottawa, Ont.—The Government has awarded contracts for the following bridges on the I.C.R.:—The Dominion Bridge Company for four bridges—namely, over the Becancour River, over the N. T. R. bridge and bridges at Riviere Du Loup and Riviere Du Sud. The Canadian Allis Chalmers Company, three bridges at West River, Barney's River and French River, in Nova Scotia; McKinnon, Holmes & Co., bridges at Black River, Riviere Le Bras, Sayabac, Ivory Road and at Oxford Subway.

Municipal

Peelee Township, Ont.—The Council will spend $6,248 on a telephone system.

Hamilton, Ont.—The people of Mount Hamilton are raising money with which to purchase a fire engine.

East Angus, Que.—The town will spend $30,000 on the completion of its water and sewer system.

Ottawa, Ont.—The district health officer has ordered the city to enlarge or improve its incinerator.

Knowlton, Que.—The Council will engage an engineer to advise them regarding an additional water supply.

Edmonds, B.C.—A company, of which Joseph Martin, K.C., is president, is applying for a franchise to run motorbuses in Burnaby.

St. John, N.B.—The city will construct a new 36 or 48 inch main from Loch Lomond to supplement the water supply. Twenty-five new hydrants are also required.

Sault Ste Marie, Ont.—The council have decided not to go ahead with plans for their waterworks for a week or so. Steelton has decided to instal its own intake pipe.

Toronto, Ont.—A new arena costing $250,000, a machinery hall costing $175,000, and an addition to the art gallery costing $30,000, will be erected at the Exhibition Grounds.

Fredericton, N.B.—The New Brunswick Board of Fire Underwriters are urging the city to purchase a motor-driven hose wagon. The Fire and Water Committees are considering the matter.

Edmonton, Alta.—Mayor Shortt announces that another incinerator will be purchased, the steam generated being used to drive generators for supplying power to the street railway.

Sherbrooke, Que.—Provincial Government engineers are preparing plans for a highway from Sherbrooke to Stanstead, tenders for which will be called late in February, and work started as soon as the snow is gone.

Port Arthur, Ont.—A committee composed of I. L. Matthews, H. B. Dawson, and E. J. Dobie, of the Board of Trade has been appointed to determine the cost of a municipal laboratory suitable for testing material such as cement and coal.

Ottawa, Ont.—Mr. Justice Lennox recently quashed the by-law granting the city power to spend $5,000,000 on the Gatineau Lakes water scheme. The city council have now passed a by-law for the expenditure of $8,000,000.

Ottawa, Ont.—The Economical Gas, Light and Power Co. have offered to instal a gas plant here, and supply gas at 75 cents per 1,000 cubic feet, if given the right to lay pipes and instal the plant. The company was incorporated at Quebec recently, with $1,000,000 capital, to manufacture gas by the destruction of peat by a special process recently invented. The head office is in Montreal, and among the incorporators is Luigi Hoz, Italian Vice-Consul.

Refrigeration

Niagara Falls, Ont.—It is proposed to convert the new Queen Street skating rink into an ice-making plant.

Montreal, Que.—The Centerfreze Sanitary Ice Co., Merchants Bank Building, is having plans and specifications completed for its proposed 100-ton ice-making plant.

Steveston, B.C.—The B. C. Granitoid Co., who have the contract for building the new Columbia Cold Storage Co. plant, have begun work, and expect to complete the building by the spring.

Windsor, Ont.—The General Storage, Forwarding & Ice Co. has been organized by H. J. Green and others, with $200,000 preferred stock and $300,000 common stock. The company is planning to build a 5-storey warehouse, partly cold storage, and in connection a 100-ton ice-making plant.

Railways—Bridges

Hull, Que.—The Hull Electric Railway Co. will extend their line to Gatineau Point.

Peterboro', Ont.—The city is being urged to erect a bridge over the Otonabee River. The city engineer is preparing estimates.

Toronto, Ont.—Construction work on the completion of the Lake Huron and Northern Ontario Railway, formerly Bruce Mines and Algoma Railway, is now going ahead.

Quebec, Que.—It is understood among the creditors of the Charing Cross bank, now in liquidation, that the Quebec Government is considering the purchase of the Atlantic, Quebec & Western Railway, whose bonds are the bank's chief asset.

Toronto, Ont.—Frank Barber, C.E., the York Township engineer, has estimated the cost of a high level bridge over the West River at Eglington Ave., 1,000 feet long, and 100 feet above the water level, at between $150,000 and $200,000.

New Westminster, B.C.—Plans for the Government bridge over the Pitt River call for a bridge 18 feet above the river, but deputations have recently urged that it be built five feet higher to obviate the necessity of opening it for tugs.

Vancouver, B.C.—Plans are being prepared for a tunnel which the Canadian Northern Pacific Railway will build from False Creek under South Vancouver or Burnaby to the north arm of the Fraser River. The engineers are considering two routes.

Ottawa, Ont.—The London & Lake Erie Railway & Transportation Co. is applying to Parliament for an Act extending the time for construction of its authorized lines and for authority to construct branches from Sparta and from St. Thomas through Aylmer to Port Burwell.

Sarnia, Ont.—The Merchants' Mutual Line and other Lake Transportation Companies are interested in plans for a railway route through Petrolea to Corunna, with radials to Courtright, Brigden, Arkona and Sarnia. The project is backed by London and Petrolea capitalists, and options for the right-of-way have already been secured.

Montreal, Que.—The C.P.R. program for next year includes double tracking between Sudbury and Port Arthur; between Port Arthur and Calgary; between Calgary and Vancouver; between Brandon and Calgary; the double track tunnel through the Selkirks; the double tracking between Revelstoke and Vancouver; a line between Sedgewick and Edmonton, 290 miles; two new lines from Bassano to a connection with Swift Current, etc.

Trade Gossip

The Aylmer Pump & Scale Co., Aylmer, Ont., held their annual meeting on Tuesday, December 2.

Mussens, Ltd., Montreal, have been appointed sole agents in Canada and Newfoundland for Detrick & Harvey, Baltimore, Md.

U. S. Iron Production.—The production of pig iron in the United States fell from a daily average of 82,153 tons in October to 74,453 in November, according to statistics given out last week.

Work Hours Reduction.—The John Morrow Screw & Nut Co., Ingersoll, Ont., owing to the slackness of business, will cut its working week to five days of eight hours each rather than lay off any men.

The Grand Trunk Railway Co. recently purchased some shops at Elsden, near Chicago, which will be used to turn out the work that would have been done at Port Huron, Mich., had that plant not been destroyed.

Nova Scotia Steel November Output.—The output of the Nova Scotia Steel & Coal Co. for November was as follows:—Coal mined, 68,000 tons; iron ore mined, 56,436 tons; pig iron made, 6,480 tons; steel ingots, 7,750 tons; steel rolled, 8,000 tons.

Alexander Gibb, St. Nicholas Bldg., Montreal, has been appointed sole selling agent in Canada for the Vaughan & Bushnell Mfg. Co., Chicago, Ill., makers of high grade tools, such as chisels, hammers, pliers, tongs, etc. These goods are well-known to the trade, the firm having been established in 1869.

W. D. Beath & Son, Toronto, have secured the contract for an electric crane for the C.P.R. Angus shops, Montreal. They recently shipped a 3-ton, 45 ft. span electric crane to the Miramichi Fdy & Machine Co., Chatham, N.B., and a 10-ton crane to the Hydro-Electric Commission, Severn River power house.

Commemorating a Record.—J. A. Higgs, superintendent of the plant of The Steel Company of Canada at Belleville, Ont., gave a banquet on Friday, November 28, to commemorate a record made in the mills recently. Sixty were present. C. O. Jolley, mill superintendent promised a banquet when the day's output reached 100,000 lbs.

The Herbert Morris Crane & Hoist Co., Toronto, have been awarded the contract for a ½-ton hand-operated crane by the Dominion Government, to be used for handling crucibles of molten gold in the Royal Mint. Owing to the excessive heat in this department, it will be necessary to make special arrangements for the lifting gear.

Large Insurance Deal.—The largest single insurance deal ever consummated anywhere has been put through in Montreal. The policy is for upwards of $100,000,000, while the property being insured, and valued at between $112,000,000 and $115,000,000, belongs to the Canadian Pacific Railway Co. Five big insurance syndicates, among them the largest company of the kind in the British Empire, are interested in the deal.

Nine Hour Day.—The Ford Motor Co., Walkerville, Ont., has decided to inaugurate a nine-hour working day in place of the present ten-hour system. It is also part of the plan to adjust the wages in all departments in such manner that no employe will lose by reason of the reduction in time. It is estimated that the loss to the company by reason of this new arrangement will be $100 a day. A bonus system which will give all employes who have been in the service for upwards of three years a lump sum of 10 per cent. of their year's salary will also be put into effect. The plan took effect from December 1st.

Prince Rupert Publicity Campaign.—Prince Rupert, B.C., has weathered the financial gale in splendid shape, declares Mayor F. D. Pattullo. Early in the New Year the city council intends to embark on a big publicity campaign, which has been deferred until the completion of the Grand Trunk Pacific was in sight. Prince Rupert is counting on a big increase in shipping from its harbor in the next few years, for, in addition to the through traffic over the G.T.P., there is a big country to the back of the city which will provide a lot of trade and the mining and fishing industries have already assumed very large proportions.

Personal

Geo. J. Webster, Toronto, has been appointed manager of the Lake Superior Iron and Chemical Co.

W. Clement, South Vancouver, municipal engineer, and formerly Vancouver city engineer, has resigned.

George Janin, chief city engineer of Montreal, has asked leave to retire on a pension of three-quarters of his salary. The Board of Control offer a pension of half his salary.

W. D. Reid, President of the Reid-Newfoundland Co., will be in Montreal towards the end of December.

T. R. Deacon, President of the Manitoba Bridge and Iron Works, has been re-elected mayor of Winnipeg.

John Turner, of the Smart-Turner Co., Hamilton, Ont., underwent an operation for appendicitis on Sunday last.

Hon. Nanthiel Curry, president of Canadian Car and Foundry Co., visited Amherst and Halifax last week.

E. O. C. Kubuel, president of the Standard Steel Construction Co., has moved his residence from Port Robinson to Welland.

J. H. Plummer reached Montreal Wednesday, Dec. 3, on his way to Sydney, N. S., and returned to Montreal on Wednesday, this week.

Angus Smith, late city engineer of Regina, has been appointed city engineer of Prince Albert, Sask., in place of H. Baker, resigned.

J. F. Taylor, president of the Lake Superior Corporation, has tendered his resignation as a Director of the Spanish River Pulp & Paper Mills, Ltd.

Robert Hobson, general manager of the Steel Company of Canada, was in Montreal last week on a visit of inspection to the company's plants there.

W. M. Arnold, who for the past 18 months has been purchasing agent for the Ottawa Car Co., has been appointed assistant manager, succeeding W. K. Jeffrey, who was made general manager.

A. F. Yarrow, of Yarrow & Co., shipbuilders, Glasgow, accompanied by his son, N. A. Yarrow, visited Victoria last week, after visiting Vancouver, New Westminster, and other British Columbian cities.

Edward J. Albert, district manager for Cobalt and Porcupine territory for Canadian Allis-Chalmers, Ltd., has been appointed manager of the mining department of the Company, and transferred to the head office, Toronto.

George D. Clewes, pipe expert of the Steel Company of Canada, has been under a strain recently owing to the illness of his wife, who was operated upon, but returned home this week, and is now out of danger.

Patrick Welch, of the contracting firm of Foley, Welch and Stewart, is dangerously ill in the Seattle Hospital, Vancouver. J. W. Stewart has taken his place as director of construction on the Pacific Great Eastern Railway, now under construction from Vancouver to Fort George.

A. D. Swan, formerly assistant engineer to the Harbor Commission of Montreal, has been appointed by the Dominion Government to advise on the selection of a site on the east coast of New Brunswick for the establishment of a new port.

Hon. T. W. Crothers, Minister of Labor, last week visited the plants of the Dominion Iron and Steel Co., at Sydney, N.S., and of the Nova Scotia Steel and Coal Co. at North Sydney and Sydney Mines.

Dr. John Galbraith, Dean of the Faculty of Applied Science of Toronto University, was the guest of the University Engineering Society last week-end at their annual dinner. Over five hundred were present, including some of the most distinguished engineers in the country.

Pigeon, Pigeon & Davis, Patent Solicitors, Montreal, report that 162 Canadian patents were issued for the week ending November 25th, 1913, 115 of which were granted to Americans, 20 to Canadians, 14 to residents of Great Britain and Colonies and 13 to residents of Foreign Countries. Of the Canadians who received Patents, 8 were residents of Ontario, 6 of British Columbia, 3 of Manitoba, 2 of Quebec, and 1 of Saskatchewan. In the United States for the same week, 610 Patents were issued, 11 of which were granted to Canadian inventors.

Miscellaneous

Megantic, Que. — Tenders are called until January 5, for the construction of a concrete dam in connection with a hydro-electric development for this town. E. A. Evans is engineer in charge.

Victoria, B.C.—The contract for the construction of the reinforced concrete flow line for the Sooke Lake water works system has been let to the Pacific Lock Joint Pipe Co. The company's bid was $329,760 for a forty-inch pipe line, but the size of the pipe has since been increased to forty-two inches.

Judge MacTavish heard an action in the Ottawa County Court last week, brought by Harry Lowe against the Ottawa and Hull Publishing Co. to recover payment for engineering work performed. The court was listening to an argument anent the armature, and technical terms were flying thick and fast. Still the judge did not understand, though the lawyers seemed to. At last his Lordship, thinking the subject quite irrelevant, remarked: "I hardly see what this turns on," to which Lowe retorted: "Your honor, it does not turn on anything. It projects out from the main part of the motor and does not turn on anything in particular."

Obituary

J. F. Wedlake, who for many years was engineer at the Massey-Harris plant at Brantford, Ont., died December 4.

George McFarlane, 356 Berkeley St., Toronto, who founded the McFarlane ladder works in 1872, died last Friday, aged 68.

F. W. Thomson, died at the McKellar Hospital, Fort William, from typhoid fever, on November 26, aged 63. He built the first stove foundry in Fort William, and invented some mining machinery.

Catalogues

The Smooth-On Mfg. Co., Jersey City, N.J., will send a circular dealing with their No. 7 iron cement for surfacing and stopping leaks in concrete, to any readers who are interested.

The Department of the Interior, Bureau of Mines branch, of the U. S. Government has published a technical paper No. 60, entitled "The Approximate Melting Points of Some Commercial Copper Alloys."

The Bennett-O'Connell Co., Chicago, Ill., have published a number of bulletins, neatly bound together, and dealing with the line of plating and polishing supplies which they make. The various items are illustrated and described, with sizes given in most cases.

The Bureau of Mines, Department of the Interior of the U. S. Government has published technical paper 30, entitled "Mine accident prevention at Lake Superior iron mines." In addition to the descriptive matter, the bulletin contains a number of illustrations and diagrams.

The Bureau of Mines, Department of the Interior of the U. S. Government has issued a miners' circular No. 13, entitled "Safety in Tunneling." The bulletin discusses the means of preventing accidents in driving tunnels, levels, etc., in mines and contains a number of valuable suggestions for reducing the number of fatalities.

The Department of the Interior, Bureau of Mines branch have published bulletin No. 69, dealing with coal mine accidents in the United States and Foreign Countries. The bulletin contains a number of tables giving the casualties in coal mines—for each State and for a number of years. Diagrams are also given showing the number killed and indicating the various causes.

The Vulcan Engineering Sales Company, Chicago, Ill., have sent us a copy of their new catalogue No. 51, dealing principally with the "Mumford" moulding machines. Each type is clearly illustrated and the principal features described fully. Descriptions and illustrations are given of the "Hanna" shakers, riddles, etc., and the Q.M.S. jib cranes, trolleys, hoists, etc. The catalogue also contains a list of users. Copies may be had by writing.

The Triumph Miniature Compressor is the subject dealt with in bulletin 510, recently issued by the Triumph Ice Machine Co., Cincinnati, O. The general design is described in detail, including special reference to the valves and lubrication. In addition to this, the installation features are dealt with. The illustrations are good, and special reference should be made to a sectional drawing in which every detail of the compressor is named. Diagrams with principal dimensions, are also given.

Hydraulic Valves and Fittings.—The Hydraulic Press Mfg. Co., Mount Gilead, Ohio. Catalogue No. 43. The first four pages cover the recent growth of the company and call attention to the special catalogs descriptive of the various designs of hydraulic presses and pumps which they manufacture. In the subsequent pages, the various types of hydraulic valves are handsomely illustrated and interestingly described. The valves are divided into four classes: Operating, Check, Knock-Out and Safety. A large variety of miscellaneous special valves is also shown.

The Joseph Dixon Crucible Co.—Engineers who keep a file of books for reference will be interested to know that the Joseph Dixon Crucible Co., Jersey City, N.J. still have a limited number of booklets dealing with such subjects as "Steam Traps," "Unions for Steam Pipes," "Feeding Graphite for Lubricating Purposes," etc., which will be sent free as long as the supply lasts, to anyone who cares for them. These treatises were prepared by the well-known engineer, W. H. Wakeman, who has written many articles on practical engineering problems. Numerous illustrations are used to make each subject easily understood. These booklets were printed some time ago, but are always desirable.

The Department of the Naval Service, Ottawa, has issued two bulletins, one containing tide tables for the eastern coasts of Canada and the other for the Pacific coast, both for the year 1914. In addition to the tide tables, the bulletins contain information respecting currents and special features of tides. The

Determining the Cutting Power of Lathe Turning Tools

By William Ripper, D. Eng. D.Sc. and G. W. Burley **

The question of the definite measure of the output of work, or of the removal of material, of which lathe-tools are capable, is one about which there is very little information readily available; and it was for the purpose of determining the behavior of cutting tools over a fairly wide series of working conditions, and of deducing therefrom some practical results, that the experiments here detailed were undertaken.

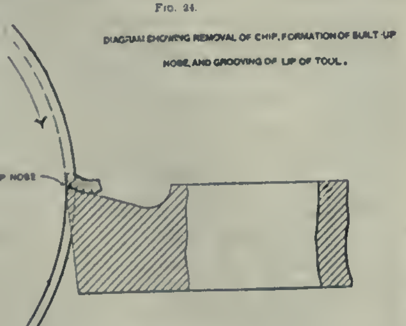
THE high-speed steel tools which were put under test were made from ¾-inch by ½-inch bars, as in the case of the carbon-steel tools, the tools being made about 8 inches in length. The shape of nose adopted for the first set of tests was that used for the corresponding ordinary carbon-steel tool tests, and as illustrated in Fig. 1 page. The tools were made of a high grade of high-speed steel, shaped entirely by grinding in a universal tool grinder—thus dispensing with the necessity of forging—and then hardened according to the directions of the maker. This size and shape of tool were adopted so that the tests would be comparable with those made on the carbon-steel tools.

A further series of tests have since been made to determine the relative effects of area of tool steel section upon the possible output, as measured by the relative areas of cut which the tools would respectively take, the conditions as to cutting speed being similar, and a series of factors obtained, so that when the output with the given section is known, the output with a tool of any other required section may be obtained by the aid of a factor.

The Test Lathe.

The tests were made on the large electrically-driven experimental tool testing lathe—18-inch centres, installed in the machine-tool laboratory of the University of Sheffield, and described later.

Fig. 24.



The Test Bars.

The test bars used were three in number and of different chemical compositions and physical properties. Their approximate original dimensions were:—

Length = 9 feet 6 inches.
Diameter = 1 foot 8 inches.

Fig. 26.

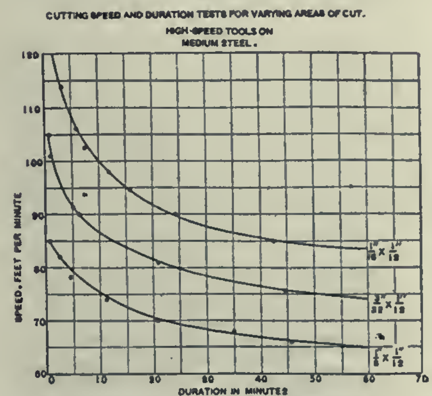
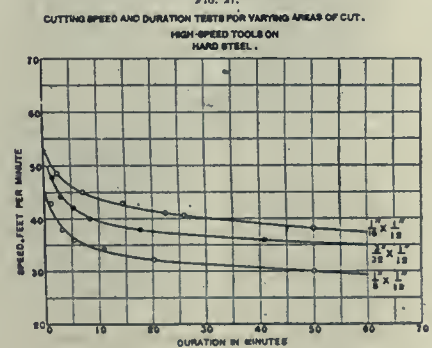
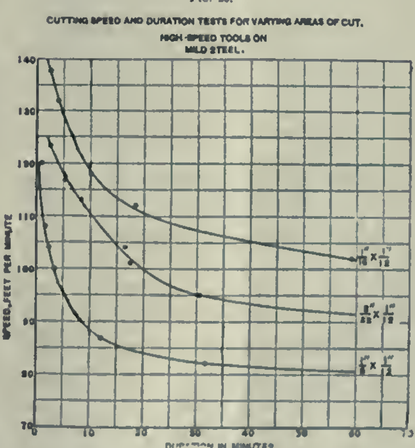


Fig. 27.



Their identification letters are A, B, and C, bar A being mild steel, bar B medium steel, and bar C hard steel. Two of the bars, the mild steel and medium

Fig. 25.



steel bars, were parts of propeller shafts of dismantled ships. The hard bar was especially cast, forged, and annealed for the purpose of the tests. Test pieces were cut from each end of the respective bars and tested. The bars

Fig. 28.

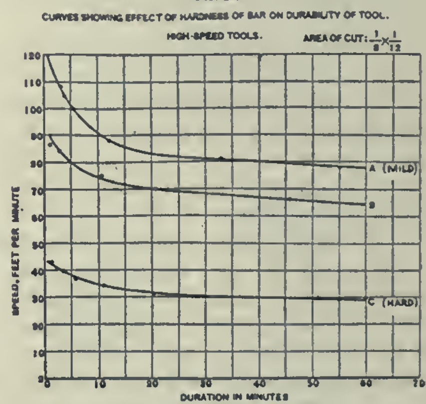
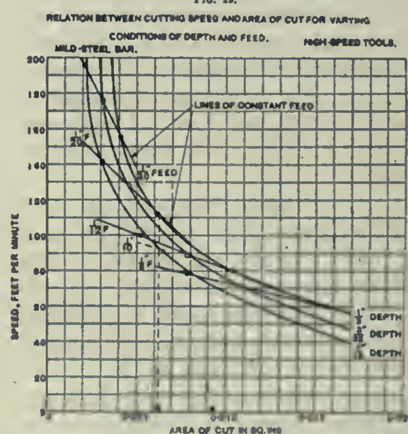


Fig. 29.



were found to be practically of uniform quality throughout.

Breaking-down Point of Tool.

With the high-speed steel tools it was not necessary to submit the cutting edges of the tools to microscopic examination, as it was found possible to obtain a definite point at which the tool failed to cut, or broke down. This is the point at which the working cutting edge collapses, and, instead of continuing to cut, causes the surface of the bar to become highly polished. The exact instant at which each tool broke down or began to produce this polished surface was observed, and from this the exact duration of the test was determined.

Standard Duration of Test.

In these tests a standard life of tool of 60 minutes was selected as being a convenient value. It is true that in ma-

*Part II. of a paper read recently before the Institution of Mechanical Engineers.
**Dean of the Faculty of Applied Science and of the Staff, respectively, of Sheffield University.

chine shops, high-speed tools are usually allowed to run for a much longer period than this before re-sharpening, and the curves of performance seem to suggest that this practice has a reasonable basis, since the cutting speed which corresponds to a life of 60 minutes is in practically every case but about 5 or 10 per cent. greater than that which will allow a tool to last for, say, three or four hours.

The failure of a high-speed turning-tool working under normal conditions is, in most cases, brought about by the fusing of the nose due to the heat generated as the result of friction. The friction is due:

(1)—To the rubbing of the chip on the upper lip of the tool as it passes off from the work, Fig. 24. This rubbing action frequently causes a pit or hollow to be worn out of the upper face or lip of the tool just in front of the cutting edge as shown in the Figure.

(2)—To the friction due to the cutting action of the tool as it traverses the work in a line parallel to the axis. When the tool is worked under conditions which are not excessively severe, the heat generated at the nose of the tool is conducted away as fast as it is generated, and thus the nose is not subjected to over-heating; but if the conditions of speed of cutting and of area of cut are such as to generate heating of the nose faster than the tool can conduct it away, fusing and breakdown at the nose takes place.

Also, as the work proceeds, the tool accumulates heat from the nose backwards, and the rate of flow or conduction of the heat away from the nose correspondingly decreases, with an increasing tendency to accumulation of heat at the nose. In the case of high-speed tools, as with carbon-steel tools, in many cases a false point is built up upon the nose of the tool composed of fine particles scraped from the surface of the work, which gives the appearance of having been fused on to the nose, and which no doubt is continually being ground away in the process of rubbing of the chip upon it, as well as replenished by the process of building up. There does not appear to be the same cumulative blunting of the high-speed tool as is the case with the carbon-steel tool, but when once the cutting edge of the tool is damaged, heating, fusing, and breakdown occur almost instantaneously.

The tools were tested for the following areas of cut on each bar:—

Depth of cut. inch.		Feed per revolution. inch.			
1-16	×	1-30,	1-20,	1-12,	⅛
3-32	×	„	„	„	„
⅛	×	„	„	„	„

Cutting Speed and Durability of Tool.

Altogether upwards of 200 tests were made, the duration of each test ranging from about 1 minute to 70 minutes. For each area of cut (or rather combination of depth of cut and feed per revolution) data for a cutting speed-duration curve were obtained, and curves Figs. 25, 26, and 27 were plotted as shown. The curves in the figures are identified with the bars as follows:—

Fig. 25 .... Bar A (mild steel)
„ 26 .... „ B (medium steel)
„ 27 .... „ C (hard steel)

FIG. 30.

RELATION BETWEEN CUTTING SPEED AND DEPTH OF CUT FOR VARYING FEEDS FOR A STANDARD LIFE OF 60 MINUTES.

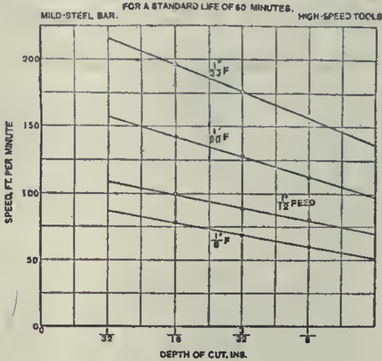
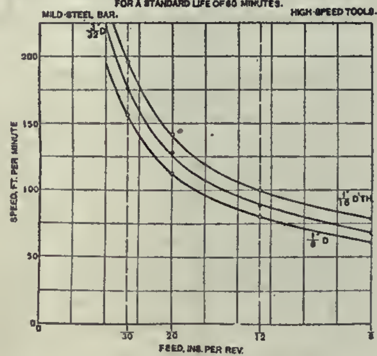


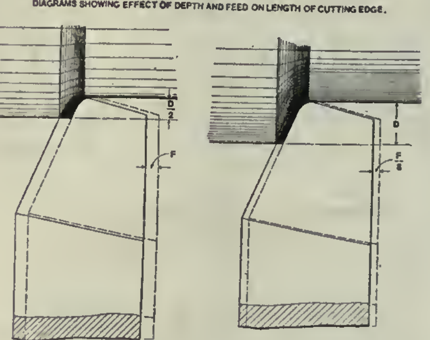
FIG. 31.

RELATION BETWEEN CUTTING SPEED AND FEED FOR VARYING DEPTHS OF CUT FOR A STANDARD LIFE OF 60 MINUTES.



FIGS. 32 AND 33.

DIAGRAMS SHOWING EFFECT OF DEPTH AND FEED ON LENGTH OF CUTTING EDGE.



The curves are for a feed of 1-12-inch per revolution of the test-bar, the depth of cut in each case being stated on the curve.

These curves, Figs. 25, 26, 27, 28, when compared with the corresponding curves for the carbon-steel tools, Figs. 12, 13, 14, show clearly the extraordinary difference in cutting speed area of cut, and output which is possible with the use of high-speed tools of the same section as in the carbon-steel tool tests. The curves also show the effects of hardness of the bar and area of cut on the cutting speed, and the relation between the cutting speed and the life of the tool up to the point of breakdown or failure. They further indicate, as do the corresponding curves for the carbon-tool tests, that, at high cutting speeds, the durability of the cutting edge is very short, but that as the rate of cutting is reduced to a speed which permits of a durability of 40 or 50 minutes, the tool then continues to cut for a more or less indefinite period, as indicated by the approach of the curves to the horizontal. If this speed is, however, exceeded by from 10 to 15 per cent., the life of the tool is rapidly shortened.

The average relation between the cutting speeds and the life of the tool M in minutes for any given area of cut between durations of 10 and 60 minutes is represented approximately by the formula

$$S \times M^{1-12} = \text{constant} \quad . \quad . \quad (5)$$

The value of the constant depends, as before, upon the quality of the steel being turned and upon the area of cut. The relation between these two quantities, as determined by Mr. F. W. Taylor for high-speed turning tools, is

$$SM^{1/8} = \text{constant}.$$

Cutting Speed and Area of Cut.

For each test-bar the relation between the cutting speed and the associated area of cut for a standard life of 60 minutes was determined, the data in regard to the cutting speed being drawn from the curves of which Figs. 25, 26, and 27 are representative. Contrary to the experience and views of Dr. Nicholson, and in agreement with those of Mr. F. W. Taylor, it was found that the cutting speed did not depend only upon the area of cut as such, independently of its component factors, but that it depended upon these factors—namely, the depth of cut and the feed per revolution, in two different ways. Thus referring to the curves on Fig. 29 and taking a cut ⅛-inch deep and 1-20-inch feed, it is seen that the associated cutting speed belonging to these conditions is 112 as measured from the top curve, where it is intercepted by the 1-20-inch constant feed line. Now, taking the same area of cut, made up by a cut 1-16-inch deep and 1-10-inch feed, the associated cutting speed under these conditions as measured from the bottom curve for the same area of cut is 93. In other words, the output in the two cases would not be the same, but in the ratio of 112 to 93 in favor of the deep cut over the large feed.

This is further explained in Figs. 30 and 31, in the former of which the relation between the cutting speed for standard tool life and the depth of cut is shown for the various feeds adopted, whilst in the latter the relation between the cutting speed and the feed per revolution is given for the various depths chosen, the curves referring to bar A in each case.

It is seen in Fig. 30 that a cut 1/8-inch deep by 1-20-inch feed is taken at a greater cutting speed than a cut 1-16-inch deep by 1-10-inch feed, which is of equal area, but less efficient as a means of output, as already explained. A similar deduction can be made from Fig. 31, where it is seen that a cut, say, 1/8-inch deep by 1-24-inch feed, is taken at a greater cutting speed—namely, 125 feet per minute, while a 1-16-inch deep by 1-12-inch feed is taken at 100 feet per minute.

Some explanation of this is given in Figs. 32 and 33. In each of these figures a tool having the standard shape of nose is represented taking a cut of a definite area, this area being the same in the two cases. In the case of Fig. 32, the depth is one-half of that in the case of Fig. 33, while the feed per revolution is twice as great. It will be noticed that the length of the cutting edge which is in contact with the work in the first case is considerably less than the corresponding dimension in the second case; and there is, in the second case, therefore, a correspondingly larger cooling area behind the cutting edge to conduct the heat away as it is generated than there is in the first case. Under such circumstances, therefore, other things being equal, the rise in temperature of the cutting edge of the second case will not be so rapid as that occurring in the first case. In other words, a higher cutting speed can be employed with the tool having the longer cutting edge.

An examination of Figs. 30 and 31 shows that the cutting speed is a linear function of the depth of cut, whilst it depends upon some power of the feed per revolution other than the first. The relation deducted from the above figures is:

$$S = \frac{K_1}{(\text{feed})\ 2\text{-}3} (K_2 - K_3 \text{ feed}) \text{ depth} \quad (6)$$

in which S = the cutting speed in feet per minute, and K_1, K_2, and K_3 are constants, the values of which depend upon the quality of the steel being machined. For the three bars, A, B, and C, the constants are as follows:—

	Bar A.	Bar B.	Bar C.
K_1	24	21	9
K_2	780	584	268
K_3	4,000	3,340	1,530

As will be shown later, however, the above formula may be reduced to a simpler though somewhat approximate form.

Output of High-speed Tools.

The standard output of a high-speed turning tool is defined in these tests as the number of cubic inches which the tool will remove in the standard life of a tool, that is, in a run of 60 minutes and breakdown at that point. This volume of material for each cutting speed and associated depth-feed combination has been calculated from data obtained by measurement from the curves for the three bars, and the relation between this quantity and the cutting speed determined for each case. The curves for bar A are given in Fig. 34; the curves for the other bars are similar in form.

This figure shows that the maximum output, or removal of metal, is associated with the lowest cutting speed, with which, for a standard life of 60 minutes, the heaviest depth-feed combination is

Fig. 34.
RELATION OF OUTPUT TO CUTTING SPEED, FEED, AND DEPTH OF CUT.

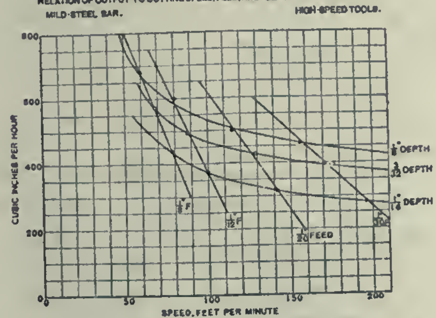


Fig. 35.
RELATION OF OUTPUT TO AREA OF CUT, FEED, AND DEPTH OF CUT.

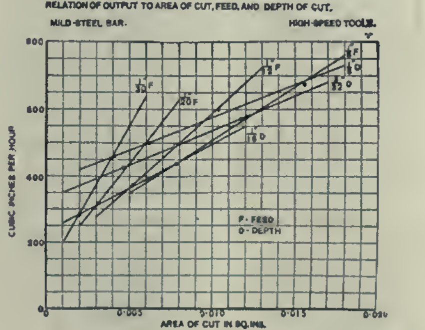
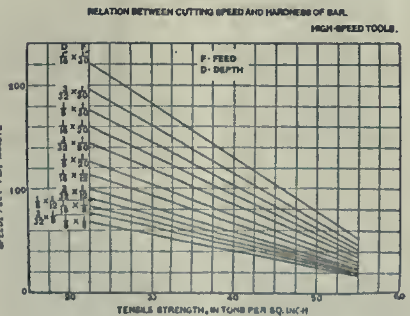


Fig. 36.
RELATION BETWEEN CUTTING SPEED AND HARDNESS OF BAR.



associated; the greater influence being, of course, on the side of the depth. Thus, with a depth of cut of 1/8 inch and a feed of 1-20 inch per revolution, the volume of metal removed in 60 minutes is 504 cubic inches; whilst, with a depth of cut of 1-16 inch, or one-half of the above and double the feed—namely, 1-10 inch, the output is 405 cubic inches per hour. This shows a gain of about 25 per cent. of output in favor of the deeper cut with a reduced cutting speed. This law applies generally to all the bars and speed depth-feed combinations. Hence, it may be stated that for the maximum tool output, the area of cut is a maximum which the tool will stand without fracture, with the depth of cut a large factor, and the associated speed correspondingly low.

This is also indicated in Fig. 35, which shows the relation between the area of cut and the output of the tool. From an examination of this figure, it will be seen that for any given area of cut the tool output is reduced if the depth of cut is reduced and the feed is correspondingly increased, this being due to a consequent reduction in the associated cutting speed for a standard life of 60 minutes. On the other hand, if the depth is increased and the feed is reduced accordingly, then the tool output is increased. This is due, of course, to an increase in the associated cutting speed.

Cutting Speed and Hardness of Bar.

In Fig. 30 is shown the relation between the tensile strength of the metal being machined and the associated cutting speed for the different depth-feed combinations used in the tests. These lines show the general condition of a fall in working cutting speeds as the area of the cut is increased and as the hardness of the material to be cut is increased. The law is practically a straight-line law, as in the case of the carbon-steel tests, the equation to the law being:

$$S = \frac{(65 - T) \times 0.207}{\sqrt[3]{\text{feed}^2} \times \text{depth}} \quad . \quad . \quad (7)$$

in which S = the associated cutting speed in feet per minute, and T = the tensile strength of the metal being machined, in tons per square inch; or, for mild steel, this equation becomes:

$$S = \frac{8.28}{\sqrt[3]{\text{feed}^2} \times \text{depth}} \quad . \quad . \quad . \quad (8)$$

This expression has been deduced in place of the more complicated expression (6) given above, and although approximate, it is only slightly so. In regard to expression (6), it should be pointed out that it could be arranged to include a function or functions of the tensile strength by determining the relation between the values of the constants, K_1, K_2, and K_3, and the tensile strength, since these—the constants—are the only quantities which depend upon the tensile strength, and they depend upon this only. Expression (7) is, however, a much simpler and more desirable form. It clearly shows that the influence of the depth of the cut is not the same as that of the feed upon the value of S, but that S is inversely proportional to the cube root of the square of the feed and to the cube root of the depth. This indicates, as do Figs. 29, 30, and 31, that, for any given area of cut, a higher "associated" cutting speed can be employed, with a corresponding increase in the output, when the cut is deep and the feed fine than when the cut is shallow and the feed coarse.

By the aid of this equation, it is easy to show the effect on the output of varying the ratio of these two factors with a constant area of cut; thus, for example, if the area of the cut is doubled by doubling the depth of the cut, the influence on the associated cutting speed is shown to be less than when this increase in area is effected by doubling the feed, as follows:—

By slightly modifying expression (7), we obtain—

$$S = \frac{K}{\text{Feed } 2\text{-}3 \times \text{Depth } 1\text{-}3} \quad . . . \quad (9)$$

where $K = (65 - T) \times 0.207$

Suppose, now, that the area of the cut is doubled by doubling the depth of the cut, the corresponding value of—

$$S_1 = \frac{K}{\text{Feed } 3\text{-}8 \times (\text{Depth} \times 2)\ 1\text{-}3} = 0.7938S.$$

If, however, the feed is doubled instead of the depth, we find that the corresponding value of—

$$S_2 = \frac{K}{(\text{Feed} \times 2)\ 2\text{-}3 \times \text{Depth } 1\text{-}3} = 0.6299\ S.$$

These figures demonstrate the point referred to above. Whilst there is only a 21 per cent. reduction in the cutting speed in the double-depth case, there is a 37 per cent. reduction in the double-feed case. Or, the double-depth cutting speed is 26 per cent. higher than that associated with the double-feed case; and since the two areas of cut are the same, the method which is associated with the higher cutting speed will, of course, produce the greater output.

The question of the influence on the output of the depth of cut and the feed per revolution can also be considered directly by regarding the cutting speed as a function of the depth and feed. Thus, let V = the volume of metal, in cubic inches, removed per hour, then—

$$\begin{aligned} V &= 12\ S \times A \times 60 \\ &= 720\ S\ A \\ &= 720\ S\ F\ D \quad . . . \quad (10) \end{aligned}$$

where S. F. and D represent the cutting speed, the feed, and the depth respectively. Now, from expression (9), we have that—

$$S = \frac{K}{F\ 2\text{-}3\ D\ 1\text{-}3}$$

Therefore

$$\begin{aligned} V &= \frac{720\ K\ FD}{F\ 2\text{-}3\ D\ 1\text{-}3} \\ &= 720\ K\ F\ 1\text{-}3\ D\ 2\text{-}3 \\ &= CF\ 1\text{-}3\ D\ 2\text{-}3 \quad . . . \quad (11) \end{aligned}$$

C being a constant depending upon the tensile strength of the metal being turned, and being equal to 149 (65 — T), T being the tensile strength, in tons per square inch, of this metal.

The influence on the speed, and, therefore, on the output of a change of feed for any given area of cut is also shown from the following: as before—

$$S = \frac{K}{F\ 2\text{-}3\ D\ 1\text{-}3} = \frac{K}{3\sqrt{F^2 \times D}}$$

but $F D = A$ (area of cut); therefore—

$$S = \frac{K}{3\sqrt{A \times F}} \quad . . . \quad (12)$$

This shows that if A is maintained constant,

$$S = \frac{\text{constant}}{F\ 1\text{-}3} \quad . . . . \quad (13)$$

Fig. 37.

EFFECT OF SHAPE OF NOSE ON CUTTING SPEED FOR STANDARD LIFE OF TOOL

HIGH-SPEED TOOLS.

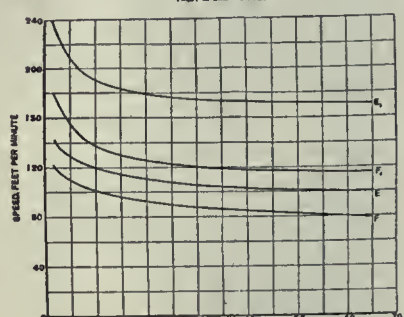


Fig. 38.

RELATIVE OUTPUT OF HIGH-SPEED AND CARBON STEEL TOOLS.

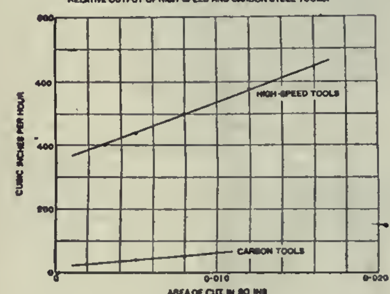
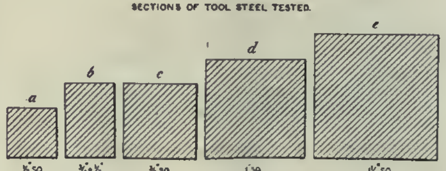


Fig. 39.

SECTIONS OF TOOL STEEL TESTED.



Shape of Cutting Edge.

As in the case of the carbon-steel tool tests, the effects of a change in the shape of the nose of the tool and in the disposition of the cutting edge of the nose with respect to the axis of the test-bar was considered. The change of the shape was made from the standard, Fig. 1, to the shape illustrated in Fig. 21. The test conditions were exactly the same as in those of the previous tests. Sample comparative curves are shown in Fig. 37. Curves E and E_1 are for the same area of cut (1-16 inch by 1-12 inch) for the two different shapes of nose on the same bar, E representing the standard, Fig. 1, and E_1 the second shape. Curves F and F_1 are corresponding curves for another area of cut (1-16-inch by ⅛-inch).

An examination of these curves will show that, for a life of 60 minutes, the second shape of nose will, other things being equal, admit of a higher cutting speed being employed, and will, therefore, be capable of greater output.

Tools of Small Section.

For an area of cut, ⅛-inch by 1-12-inch, the cutting speed which will allow the tool to last one hour under the above conditions is 78 feet per minute for the high-speed tool, and 8 feet per minute for the plain carbon-steel tool on a bar having a tensile strength of about 25 tons per square inch. This ratio is about 10:1, that is, for a cut as above, the high-speed tool will remove ten times as much metal from stock as will the plain carbon-steel tool in a given time; or it will remove any given amount in one-tenth of the time.

A graphical comparison of the performance of high-speed and plain carbon turning tools is shown in Fig. 38.

Output and Cross-sectional Area of Tool-Steel.

To find the effect on the output of the use of high-speed tool-steels of various cross-sectional areas, a number of experiments were made with tool-steels of sections shown in Fig. 39, commencing with ½-inch square section, and proceeding to ¾-inch by ½-inch; ¾-inch square; 1 inch square; and 1¼ inch square. All these tools were prepared with a cutting edge of exactly similar geometrical form at the cutting nose, the form being the same as already illustrated in Fig. 1. The tools were all tested on one common mild-steel test-bar A about 20 inches diameter and 10 feet long.

The object of the tests was to determine the maximum output with tools of each of the above sections, and then to compare the relations of these outputs with one another. The method adopted for determining the maximum output was to employ the "speed-increment" test described later.

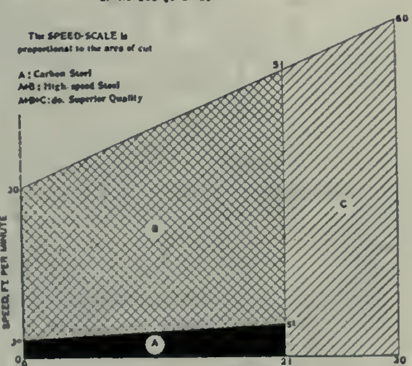
An experiment was first made upon sample tools of each section to find what depth of cut the tool would take, with a given feed, to break it down in exactly 20 minutes. It was found possible to adjust the depth of cut in such a way that the tool would break down within a few seconds above or below the 20 minutes period. The feed was kept constant at 1-12-inch per revolution throughout all the tests. The commence-ing cutting speed chosen was 75 feet per minute, and the cutting speed was increased by 1 foot per minute speed increment, every minute, until the breaking-down point was reached. The breaking-down cutting speed in each case was, therefore, 95 feet per minute.

The total material turned off during the test for each particular tool section is proportional to the respective depths of cut employed. The results of the tests are plotted on Fig. 40, and a curve drawn through the points, a, b, c, d and e representing the results obtained respectively with the tools of the above sections. The tool taken as the standard or unit section was ¾-inch by ½-inch, this being the size of tool employed throughout all the tests mentioned in the previous parts of the paper, see b, Fig. 40.

From this curve it is now possible to convert the output obtained with a cutting tool of any given section into its equivalent output for any other given section, each working respectively with its appropriate or associated area of cut. Since the speeds in these tests

Fig. 44.

AREAS REPRESENTING RELATIVE OUTPUT OF TOOL STEELS OF VARIOUS QUALITIES



were similar for each size of tool, the respective output factors represent actually the proportional areas of cut taken by the standard tool. Thus, taking the ¾-inch × ½-inch as the unit, the following table of factors is prepared so that when the output given by the ¾-inch × ½-inch tool is known, this output multiplied by the factor opposite the required section of tool-steel gives the equivalent output for that section. The factor is also shown on a scale on the right-hand side of Fig. 40.

The relation between the cross-sectional areas of the tool-steels and the associated depth of cut with constant feed and constant average cutting speed is found to be given approximately as follows:—

$D = \sqrt{A} \times$ constant, . . . (14)

in which D = the depth of cut (with a constant feed and constant average cutting speed) and A = the cross-sectional area of the tool-steel; also

Output $= \sqrt{A} \times$ constant . . . (15)

Equivalent Output for Tool-steels of Various Sections.

Section of Tool-Steel. Inches. × Inches.	Output Factor.
½ × ½	0.80
¾ × ½	1.00
⅝ × ⅝	1.17
¾ × ¾	1.27
⅞ × ⅞	1.43
1 × 1	1.60
1⅛ × 1⅛	1.73
1¼ × 1¼	1.87
1⅜ × 1⅜	2.00

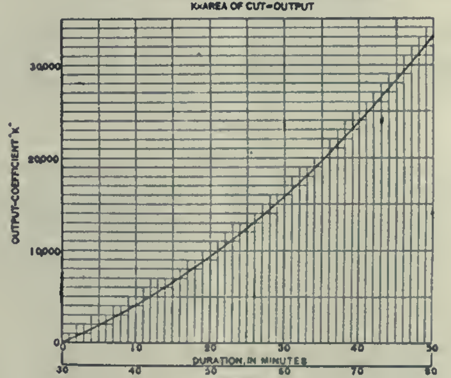
Relation of Motor Power to Output.

To determine the relations existing between the area of cut, the associated speeds, and the actual horse-power requirements, tests were made on the different bars with the various adopted depths of cut and feeds and their associated cutting speeds, the power consumption in each case being obtained by taking voltmeter and ammeter readings. These readings were taken when the cut was in, and again when it was not in (the speed being the same in each case), the net horse-power (that is, the horse-power required to accomplish the actual

Fig. 45.

STANDARD CURVE GIVING VALUES OF THE OUTPUT-COEFFICIENT "K"

K×AREA OF CUT=OUTPUT



cutting) being calculated from the difference between the two readings.

It will be seen that the actual net horse-power required to remove a given number of cubic inches per hour is a constant for each quality of steel machined. In other words, the output per horse-power is practically a constant quantity; that is, for a given output per hour there is nothing to gain from the point of view of economy in net power consumption by altering the ratio of area of cut to speed of cutting, the net horse-power required being approximately directly proportional to output only.

Another point to observe is that the number of cubic inches removed per horse-power depends upon the hardness of the bar being machined; the harder the bar the less the number of cubic inches removed per horse-power hour.

If the results of the experiments shown in the tables are plotted, and an average line be drawn through the points, an approximate law can be determined showing the relation of output in cubic inches per horse-power hour to hardness of bar. This line is drawn in Fig. 41, and the law determined from it is found to be given by the formula.

Cubic inches per h.p. hour $(167 - 1.7\ T)$ . . . . (16)

where T = tensile strength in tons per square inch; or, expressed as weight W in lb. per h.p. per hour,

$W = (47 - 0.48\ T)$ . . . (17)

Again, if the tensile strength of the material being turned is plotted against the net horse-power required per lb. of material turned off per minute, it will be found that the power required for any given quality of bar (see Fig. 42) is expressed by the formula.

Net h.p. per lb. per minute $= (0.8 + 0.37\ T)$ . . . . (18)

Thus, taking $T = 25$ tons per square inch, we have

Net h.p. per lb. per minute $= 0.8 + 0.37 \times 25 = 1.725$.

It should be noted that the power given above does not include the power required to drive the lathe itself when running with the cut withdrawn. The additional power required to drive the lathe when the cut is in inches:—(i)—The power required to perform the operation of cutting, together with (ii) the additional friction of the lathe-saddle on its bed due to the pressures on the tool. The latter item (ii) is small, and the whole additional power is, therefore debited to the process of cutting.

Conclusions From High-Speed Tool Tests.

1.—The breaking-down point of a high-speed tool is usually well defined, it being indicated by a more or less sudden refusal on the part of the tool to cut, accompanied by a polishing of the surface of the work due to collapse by fusion at the cutting edge.

2.—The durability of high-speed steel tools is in all cases some function of the reciprocal of the cutting speed; in other words, the higher the cutting speed the shorter the durability, and vice versa.

3.—For a reasonable working duration or life of a tool (say, 60 minutes as a standard) high-cutting speeds are invariably associated with light cuts, and low-cutting speeds with heavy cuts; that is, high-cutting speeds and heavy cuts do not co-exist.

4.—The cutting speed which is associated with a given area of cut to permit of a given or standard life of tool depends upon the relation between the depth of the cut and the feed per revolution, so that there is a definite "associated" cutting speed for any area of cut for each of the ways in which the depth and feed are combined to form the area.

5.—If the area of the cut is kept constant, a higher associated cutting speed is obtainable when the cut is deep and the feed fine, than when the cut is shallow and the feed coarse.

6.—A tool working at a low-cutting speed with its associated depth-feed combination will accomplish a greater output in the standard life of the tool than will a tool which is working at a high cutting speed with its associated depth-feed combination.

7.—For maximum tool output the area of the cut employed is the maximum which the tool will stand without fracture, with the depth of cut a large factor and the associated cutting speed correspondingly low.

Fig. 40.
EFFECT ON OUTPUT OF CROSS-SECTIONAL AREA OF TOOL STEEL

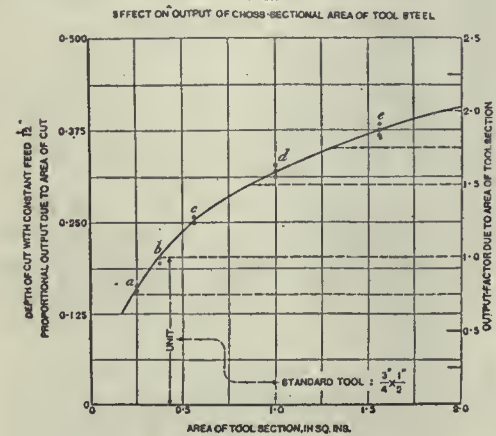


Fig. 41.
RELATION OF OUTPUT PER NET H. P. HOUR TO TENSILE STRENGTH OF BAR TURNED.

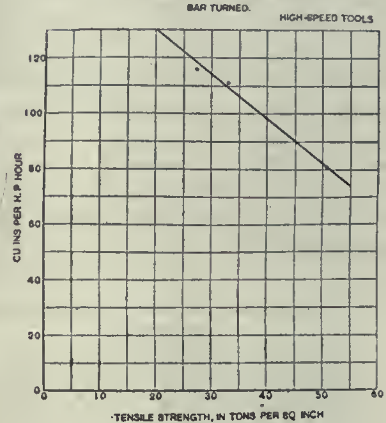


Fig. 42.
RELATION OF NET H. P. PER LB. OF OUTPUT PER MINUTE TO TENSILE STRENGTH OF BAR TURNED.

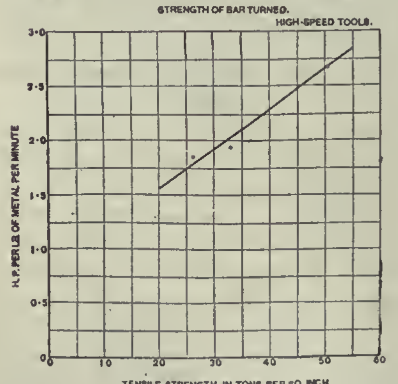
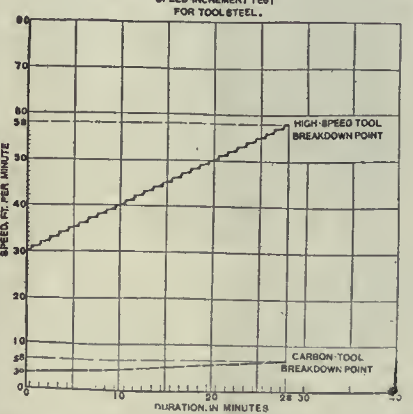


Fig. 43.
SPEED-INCREMENT TEST FOR TOOL STEEL.



8.—The associated cutting speed for any depth-feed combination depends upon the quality of the material which is being operated upon, a high cutting speed being associated with a low degree of hardness, and vice versa.

9.—A tool with a long cutting edge has a longer life (under similar conditions of depth of cut, feed per revolution, cutting speed, and tensile strength of the metal being machined) than one which has a short cutting edge.

10.—The number of cubic inches removed per net horse-power hour is practically a constant quantity for each quality of material turned when the tools work under the standard conditions, whatever the area of cut or depth-feed combination.

There is, therefore, no economy in energy-consumption to be gained by using high or low-cutting speeds, or light or heavy cuts, provided that the tools work under standard associated conditions of speed and cut. There is, however, an economy in time-consumption to be gained by using low-cutting speeds and the heavy cuts associated with them.

Speed-Increment Test for Turning Tools.

Since the introduction of high-speed steel for turning and other tools, the question of the comparative testing of steels of this kind has become a very important one, both to the manufacturer and to the user of such steel. Comparative tests are necessary to the manufacturer in his efforts to improve the qualities and capabilities of his products (from the standpoint of chemical composition as well as of heat treatment); and to the user in his efforts to compare the various makes of steel of this kind, with a view to obtaining the best tool for any particular class of work.

The ordinary comparative test consists of running the test-bar at a constant circumferential speed (such as 60 feet per minute) and causing the tool to take a cut of standard dimensions until it breaks down or loses its cutting edge, the duration of the test, or the life of the tool under such circumstances, being taken as the criterion value by which to estimate the quality of the tool.

The method introduced and adopted by Mr. F. W. Taylor involves the selection of a fixed duration of test—namely, 20 minutes, the object of the test being the determination of the speed (under given and constant conditions of area of cut, etc.) at which the cut may be made to break down the tool in 20 minutes. To carry out this test satisfactorily, a fairly large number of tools must be made from the same bar of steel, the required number varying from four to eight.

The method adopted in the machine-tool laboratory of the Sheffield University is one in which a uniformly accelerated cutting speed is the essential part. The form of the test is comparable with the method of applying the load in a tensile test. It has been designated the "Speed-increment Test," because starting at a definitely fixed cutting speed, a constant increment of 1 foot per minute is added to this cutting speed every minute. The number of cubic inches which the tool removes up to the point of break-down is taken as the numerical value by which its quality is judged.

The principle of this test is as follows:—The tool is started to cut at a starting speed of 30 feet per minute with a standard area of cut on the test bar. By "standard area of cut" is meant the area of cut which will secure a test of about 20 minutes' duration for one tool of the set, its magnitude varying according to the hardness of the test-bar and the sectional area of the tool-steel. This area of cut, once decided, is used for each tool of the series.

This cutting speed is accelerated at the end of each minute at the rate of 1 foot per minute, to the end of the test, that is, until the break-down point of the tool is reached. At the beginning of the test the first speed of 30 feet per minute is run for ½ minute only, for the purpose of getting a straight average line on the output diagram, Fig. 43. In all other cases the time of running is a one-minute period for each newly accelerated speed.

From the data obtained during the test, the number of cubic inches of metal removed by the tool during the test can be calculated, this number being taken as the criterion value by which the quality of the tool is judged. This number equals the average cutting speed during the test in feet per minute $\times$ 12 $\times$ area of cut in square inches $\times$ duration of the test in minutes.

The speed-time curve for this test is indicated in Fig. 43. The stepped line indicates the progressive nature of the test for high speed steel to the breaking-down point. Towards the bottom of the diagram the same method of test is shown for the carbon-steel tool. The vertical scale in the two cases is made proportional to the respective areas of cut. The vertical steps in the case of the carbon-steel tool are too small to be shown. The areas enclosed between the respective speed-increment lines and the base represent the amounts of material removed.

In Fig. 44 are represented the cases of three tools:

(1)—A plain carbon-steel tool; (2)—an ordinary high-speed tool; and (3)—a superior high-speed tool. In the case of (2) and (3) the same area of cut was used, but in the case of the first a much smaller area of cut had to be used, the ratio of the two areas being equal to the ratio of the speed scales of the figure. Tools Nos. 1 and 2 lasted for 21 minutes, whilst tool No. 3 lasted for 30 minutes. The output of the plain carbon-steel tool is represented by the area A; that of the ordinary high-speed tool by the sum of areas A and B; and that of the superior high-speed tool by the sum of areas (A + B) + C.

The final speed of cutting of the first high-speed tool was 51 feet per minute, and of the second high-speed tool 60 per minute, so that the mean cutting speeds were 40.5 and 45 feet per minute respectively; therefore, the criterion values of these two tools were respectively $(40.5 \times 21) = 850.5$; and $45 \times 30 = 1{,}350$. The ratio of these two values — namely, $\frac{1{,}350}{850.5} = 1.5$ is the ratio between the two areas (A + B + C) and (A + B) represented in Fig. 44, the larger area representing the case of the better tool.

This test can only be made on lathes which are provided with means whereby the speed can be changed instantaneously (or nearly so) and in regular and definite amounts.

To render elaborate calculations unnecessary in connection with this test, a curve Fig. 45, which gives the relation between what has been designated the "output co-efficient" and the duration, has been worked out. This co-efficient is actually the length of the turning removed under the above conditions by the tool in inches in any given time, so that the number of cubic inches removed in that time is found by multiplying the constant for the time by the area of the cut. This renders the determination of the average speed during the test unnecessary. The diagram, Fig. 45, is used as follows:

The zero of the diagram represents the starting point of the test at the cutting speed of 30 feet per minute; at the end of 10 minutes the speed has obviously increased to $(30 + 10) = 40$ feet per minute; at the end of 20 minutes the cutting speed is $(30 + 20) = 50$ per minute, and so on.

To find the material turned off in the case of a tool which has broken down after a speed increment test of, say, 33 minutes, we take the value K from the diagram, which is 18,000. Multiplying this by the area of cut equals the output in cubic inches, which is the number representing the criterion value of the tool; thus for a cut 3/8-inch by 1-12-inch, we have 18,000 by 3/8 by 1-12 = 562.5 criterion number. A special feature of this method of testing tool-steels is the exceedingly regular results obtained when repetition tests are made.

The Attribute of Loyalty Relative to Business Life*

By Charles L. Clarke **

The author of this paper is a keen observer of human nature and recounts a number of its more or less prominent weaknesses when tasks irksome and distasteful fall for performance. The appeal for whole-hearted loyalty, and a determination to overcome or at least minimize the tendencies towards its repudiation, implied or otherwise, is a universally personal one.

THE geenral subject of loyalty in business life should always be of interest because it concerns certain relations between men that vitally affect their material interests. It is specially worthy of earnest consideration by the younger men, whose business careers still lie in the future, and whose habits of mind and dispositions have not become so firmly set that they should have much difficulty in subjecting themselves to a fair self-examination in the light of reason, and, if necessary, gain thereby with sensible exercise of will such control over adverse inclinations, when present, as will naturally cause them to be loyal to their business associates on every occasion. The younger men might here note the words of the immortal Franklin, who made the appropriate remark, through the sayings of "Poor Richard," that " 'Tis easier to prevent bad habits than to break them."

It must be admitted that the subject of loyalty is a delicate one to deal with, when presented, as in this instance, to one's business brethren, but here, again, heed Poor Richard's injunction: "Love your enemies, for they tell you your faults;" although it may be admitted that human nature is so constituted that sometimes a friend is not so easily forgiven as are enemies for doing this kindness.

The attention given the subject here will be distinguished more by what is omitted than by an exhaustive presentation of its many sides, and it is left to the imagination and experience judiciously to read between the lines to supply the missing links, and make such personal application of the whole as self-examination and conscience may direct; for, in matters pertaining to loyalty each individual must shape his own course, as he is the maker of his own destiny. No one can supply the deficiency of another in this essential for a helpful attitude toward those joined in effort for a common good.

The Definition of Loyalty.

It is unnecessary to comb the dictionaries for scholarly definitions of the term "loyalty," or to find out what "business life" means. Normally constituted persons will doubtless substantially agree to the general proposition that loyalty in business life is the faithful endeavor successfully and justly to perform an assigned task or duty of lawful nature, with which two or more persons are concerned, relating to some mutual material advantage measurable in dollars and cents.

Further, for the purpose of keeping consideration of the subject within reasonable bounds, that we may not become lost in the mazes of a philosophical dissertation, and fail to make such practical application of its leading principals as may be advantageous to ourselves, let it here be restricted to loyalty in duties required to carry on the affairs of a corporation, which are apportioned to employes in accordance with a system of management organized for orderly and profitable conduct of business.

Loyalty to a Corporation.

The loyalty, then, that should subsist in a corporation is:

1.—Loyalty to the system of management as organized, and not, necessarily as one may think it should be, and would like to see it organized. The sys-

*From the General Electric Review.
**Consulting Engineering Dept., General Electric Co.

tem is impersonal, and comprises a code of corporation business rules and regulations, sanctioned by law and effective thereunder. It is the guide-post which points in the directions in which employes should go in the line of efficient duty; if not thus guided and obedient thereto they would soon become lost in confusion. The rules and regulations of a corporation are the underlying means by which duty is assigned and directed, and anything less than faithful effort to observe them is disloyalty to the whole business in hand and to every one whose welfare depends upon its success.

2.—Loyalty within the system to the persons in whom is vested the authority to manage the details pertaining to the assignment and direction of duties. Those in authority are absolutely dependent upon the loyalty of others under them for the business success of a corporation, and they could accomplish nothing without it no matter what their own ability might be. The higher the plane of authority on which they stand, the wider becomes the scope of the undertakings for which they are responsible; the greater are the trials they have to bear, and the severer is the tax on their patience, resourcefulness, common sense and endurance to keep even themselves in every way loyal to the trust imposed upon them under the system. Thus, they need the loyal support of every one else to a special degree.

3.—Loyalty within the system between those whose authority or duties are practically co-extensive. Here, there should be unreservedly faithful co-operation, absence of petty jealousy, undue self-seeking, over-reaching, bickering and backbiting, which interfere with efficiency and can prove serious forms of disloyalty, and are liable, even if the seed be sown by only one person, to produce much harm.

4.—Loyalty, irrespective of the system, between all employes of whatever grade, based upon mutual respect, general good will, pride in connection with the organization and with associates, and a sincere desire to help to the best of their ability to promote success.

Self Control and Patience Necessary.

It is not easy for every one, and, at times, not even for those most experienced and disciplined, always to be loyal to every duty. Sometimes its performance, as the saying is, "goes against the grain," in which case such adjustment to conditions should be made that "chips do not fly." At other times its performance may seem unnecessary, or the wrong way of getting at a desired result, and these are times when loyal patience is called for, patience to wait for time to tell one whether after all he may be mistaken or to correct a method, if later found not the best one to pursue. While it is easy to be patient under accustomed circumstances, it becomes more difficult of exercise under trying conditions, when most required, in which connection it should be helpful to remember that Poor Richard said: "What signifies your patience if you can't find it when you want it."

Temperamental Peculiarity Hindrance.

Temperamental peculiarities seem to make it practically impossible in some unfortunate instances for loyalty willingly to exist, the misfortune being mainly harmful to those thus afflicted, for they are either certain to be kept outside the pale of organized business, or to be bound hand-and-foot by limited duties and restricted authority so that they lose opportunity for achievement and advancement that might be theirs.

Then, there are some whose characteristics only occasionally cause them to clash with the business system or with their co-workers, and become disloyal by not taking up and endeavoring to perform an allotted duty in line with the directions of their superiors. The effect is disturbing, so much so as to have a correcting influence on men of intelligence toward lessening or preventing repetition of the mistake. If they prove to be men in positions of authority, Poor Richard here advises them: "He that cannot obey cannot command."

Specialization Hindrance.

Sometimes the cause of opposition to authority and orderly compliance with a business system proceeds not so much from temperament as from specialization, to the neglect of the everyday concerns of life. While there has been development in a particular direction to an unusual degree, advancement in other ways, essential to constitute the normal practical man, is wanting.

It is true, the specialist and his calling may be such boon companions that there is intense satisfaction in the partnership. Nevertheless, when it leads to a life so self-centred that the outside world—in which he would naturally prefer to include the corporation from which his subsistence comes—is largely unknown or quite forgotten, the points of business contact and resulting pressure of duty, which must exist at times, are apt to be resented as an intrusion and infraction of an imagined right simply to be let alone and not be bothered. Or he may not only be specialized so highly, but so self-exalted, perhaps over some truly noteworthy achievement, as to arrogate to himself special rights superior to the system, and consider himself not accountable to his immediate superior, but somehow entitled to sit at the right of the throne and otherwise do about as he pleases.

He is likely to have what he chooses to call his "self-respect" easily injured by his superiors acting under the compelling requirements of business, but closer examinations would often discover that only his conceit has been pricked. A real or imagined injury to one's self-respect is no excuse for non-performance of duty. Even should the injury be real, the act of the offender which would constitute disloyalty on his part. conveys no right to retaliate by being in turn, disloyal; there are obviously other and proper ways of mending the fault.

It behooves such a person, when he feels that he is being imposed upon by the system, to realize with Poor Richard that "It is the easiest thing in the world for a man to deceive himself," and try to discover whether this may be the fact in his case, and ascertain if he be after the truth, that his first duty is loyalty to the system whatever it may be, at least as long as he chooses to rely upon it for his bread and butter.

The Jealousy Feature.

Jealousy, which in its different manifestations may be given various names but smells no sweeter therefor, is, perhaps, the most frequent cause for lapses in loyalty. It is generally of the petty, evanescent sort, and fortunately, rarely manifests itself in the region of large responsibilities. Every one knows the cure, namely, get over it; towards the accomplishment of which end the realization that all must loyally work together, if the payroll is regularly to be met, should help.

Constitutional Derangement Feature.

The speaker will not trench upon the ground preempted by those engaged in the profession of healing bodily ills, further than to say that he has often noted instances where the question, whether a man would prove loyal or not for that day or longer was sure to depend upon the state of his digestion and thus his nerves. For such a condition of affairs there is no legitimate excuse. Ill health and nerves, short of derangement, will not interfere with loyalty, if the innate disposition is in that direction, or if experience has taught one wisely to control an antagonistic nature, and in any case, it is profitable to realize that, while incapacitating disability is no excuse for refusing, or grudgingly and inefficiently to perform one's duty, nevertheless, it properly justifies obtaining release therefrom.

The Crank.

Finally, there is the cranky man, who gets at odds with the system and with his associates on the most unlooked for occasions and for inexplicable reasons. His misfortune is inability to control impulse by exercise of will power, and he should make a special study of ways and means to cure the defect. Often he is mostly of good steel; the knife passes inspection and is placed in stock although the defects are recognized, but it will not, to his detriment, be rated A-1.

Do not let those that are disposed to chafe under the impersonal, impartial working of a business system, peevishly fall into the error of imagining that it was designedly created for their personal discomfort, as some appear to do. If, now and then, its application by a superior seems in some respects not just as it should be and disposes one to be disloyal, take Poor Richard's hint that "There is a time to wink as well as to see." Before we are over winking the incident is past and forgotten. Moreover, do not overlook the fact that superiors in authority generally have to do by far the greater part of the total winking, to the comfort and benefit of uneasy ones under them.

Schooling by Hard Knocks.

Whether the writer has appropriated the privilege of presenting some business principles, we may say maxims, that might more properly have issued from those in authority cannot be stated; possibly they have already expounded similar principles before our advent. Or, it may be, they have deemed it a better plan to let individuals work out their own salvation through experience acquired from hard knocks, in spite of the fact that, if analyzed to a conclusion, they will ordinarily be found to have a reactance quality, producing more or less of a hitch in the orderly flow of current affairs.

Some may have adopted this policy on the principle that a knock now and then may make the recipient, who invites it and is really worth keeping, wiser and hence more valuable. If such has been their policy, they may be quite right. Large manufacturing corporations today have generally adopted the policy of inaugurating special educational courses, at no inconsiderable expense, calculated to improve certain grades of service; and it may not prove a bad investment to foot the bills involved in maintaining a School of Hard Knocks, for inculcating and disseminating among naturally able employes, who may, unwittingly or in a temporary fit of perversity, have gone wrong, a correct understanding of the practical laws concerning the art of rendering their relations with business associates of maximum efficiency through loyalty.

By this time the reader may be wondering whether to plead guilty or not guilty. This is entirely unnecessary; no indictment has been found; the writer has filed no bill of complaint, or even expected to tread on anybody's toes, and undoubtedly has not done so. Although loyalty has been the subject under consideration, antithetically, disloyalty has necessarily been referred to, but there is no occasion for pessimism for human nature is more inclined to the virtues than to the wrong; and let it be known that loyalty in business is the rule and disloyalty is the rare exception, so rare in fact, and out of the normal, that for this very reason, it arrests immediate attention, and all the more so because of the always painful disturbance its occurrence produces in the customary, orderly progress of affairs and relations between men.

The stronger the effort made by all within the various departments of this great organization to constitute themselves a brotherhood of open-minded, open-hearted, mutually helpful men loyal to one another and especially so to their respective chiefs, the nearer will be the approach of the departments to ideal efficiency in performing the functions assigned to, and expected from them.

CORROSION AND RUSTING OF IRON.

MR. ERIC K. RIDEAL, in a recent paper before the Society of Engineers, said that a certain number of failures in constructional ironwork may be attributed to corrosion, and that rusting is a problem of the greatest importance to the water engineer. The author is a supporter of the electrolytic theory of corrosion, and believes it to be perfectly tenable when due attention is paid to considerations, such as alterations in the solution-pressures on crystal surfaces, and to the phenomenon of passivity shown by this metal.

Corrosion is due either to internally generated electric currents or to those from external sources. The theory is applicable to the problems of rusting in ferro-concrete, waterpipes and structural ironwork, as well as to the action of stray currents from tram rails, damp electric light leads and telephone cables.

In the light of that theory, both the plating of iron with metals or covering the surfaces with paints and varnishes are to be regarded as means to an end—namely, to prevent the formation of local "corrosion cells." The effect of pitting in steel pipes is to be attributed to inclusions of slag and oxides of iron.

Metallic coatings must be perfectly uniform in character, otherwise rusting may be augmented instead of retarded by such processes, while paints should be applied to clean surfaces and should possess certain definite characteristics, such as high specific electrical resistance, a pigmentary vehicle that does not readily liberate water during the process of aerial autoxidation and is not permeable to water vapor when thus oxidized, and pigmentary particles not widely separated from iron in their electrochemical potential.

PROTECTION OF UNFINISHED CONCRETE WORK FROM FROST.

IN a paper before the Boston Society of Civil Engineers, recently, Leonard C. Wason, president the Aborthan Construction Co., Boston, Mass., stated that the aggregate must be free from frost when mixed. A live steam pipe can be shoved into the sand pile, the escaping steam heating it and removing all frost. The same may be done with the stone, but a canvas should be thrown over the top of the pile to retain the heat, which more readily escapes. Where a considerable amount of heating is provided for in advance, steam pipes are laid on the ground, and stone as received is dumped upon them. Then there is a canvas thrown over to prevent storms getting into the pile, and to retain heat. The frost is thus easily and economically removed.

"Salt is frequently used in the water to lower its freezing point, and it is seldom worth while to heat the water itself. Little care need be used to prevent mass concrete from freezing, as the frost will usually only strike to a depth of about one inch. Buildings are enclosed with tarpaulin tied onto an outside staging, and the enclosed space is heated with salananders burning coke. Sometimes it is possible to use steam.

"Frost is removed from work done by the use of salt and steam, and if the concrete surface is left rough it is common to sprinkle the top surface with salt to prevent freezing. In winter it is very common to put the finish on as a separate operation, after the building is enclosed, and not as an integral part of the construction, on account of the danger of freezing. After it is put on, it must be kept from freezing for the first forty-eight hours.

"The expense of protection against the weather is not very great, and good results can be so surely guaranteed that it is not usual for the writer ever to discontinue work on account of cold weather.

"Occasionally, however, it is necessary to make some provision for the protection of the men. Shelters or windshields are built in front of the benches where carpenters are making up forms, as well as around the men at the concrete mixer, whose work does not necessarily keep them warm. Where excavation is going on in the open, it is expedient to have a building with a good fire where the men can warm themselves when necessary; and on a few jobs it has proved to be wise to furnish hot coffee free in these shelters."

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

THE PROFESSOR DID NOT SEE THE TAPER.

By N. G. Near.

A contractor and his gang were installing boilers for a heating system in a college out west a few years ago. The main steam pipe lines were 12 inches in diameter. All drawings had been presumably carefully made by the designing engineers and draftsmen, hence the most difficult machining was performed before the materials were shipped to the job. It was discovered, however, when a certain point was reached, that a slight error had been made by the designers or the machinists, necessitating the cutting and threading of one of the large pipes.

The contractor did not have any difficulty in cutting the pipe, but he had no means for threading it. On inquiry he learned that there was a machine shop in connection with the college in which youngsters are taught the fine art of turning metals, forging, founding, etc. He carried the piece of pipe over to the shop and inquired for the "Professor." Out west everybody connected with a college is known as "Professor" or "Doctor." The young but dignified professor was quickly found by one of the students and the difficulties explained by the contractor. The instructor took the matter very seriously. He concentrated for a few moments on the problem in hand, making a visible effort to maintain his dignity before his pupils and at the same time impress on them the importance of the prospective undertaking. After due deliberation he said to the contractor, "I shall grant your wish instantly." Forthwith he clamped the pipe into the largest lathe in the shop and turned the job over to his most promising prodigy. Of course, the professor gave the matter his own undivided attention and was himself responsible for all that happened.

The contractor thinking that there were brains enough on the job to successfully produce the results wanted, believed his presence no longer necessary. In fact he was highly pleased with prospects. He left the building with his broadest smile congratulating himself the while for having fallen into such good luck. He knew very well that considerable time would have been lost had he found it compulsory to send the pipe back to the city for threading. He would now save both time and cost of express.

The professor, as I have already intimated, was young, and he also lacked experience, his sole experience having been in that very college where he excelled in turning out "exercises" as per simple blueprints, and, later, on being appointed instructor, in the supervision of the turning out of these selfsame exercises. Once in a while he had to contend with "practical jobs" that came up in and about the school and they helped considerably, but he had never been up against anything just like this. Still, it looked fairly easy to him. He had made the error of cutting a left hand for a right hand thread on one of these practical rush jobs, so naturally, he didn't repeat that error, and he carefully cautioned the prodigy to make it right handed. However, despite his caution, he did neglect to make use of his taper attachment. The thread on the other end of the pipe which he was instructed to duplicate, was in plain view at all times while the lathe was not running, careful measurements were made over this thread to assure the correct number per inch and the threaded distance was measured with most extreme caution, but neither the professor nor the boy observed the taper of the thread which is common in all pipes and present in all pipe dies.

Even the contractor did not notice the difference when the "completed job" was turned over to him by the proud professor. The face of the contractor was wreathed in more smiles than when he left the building the first time, the job having been finished with utmost promptness. "Ah," thought he, "What a cinch." The pedagogue would take no money for the work inasmuch as the school was a State Institution and such practical work "provided good experience for the students."

The contractor carried the pipe to the boiler house, laid it near where the steam fitters were working, called their attention to it and informed them that all was well, and then drifted off to other parts. The fitters were the people who discovered the error, but, not immediately. The man who first picked up the pipe remarked, "Looks like a pretty durn good clean thread, don't it Jim? Guess we won't have no trouble here." They didn't like the way it screwed in, however. It went in easily up to the point where the thread ceased and there it stopped abruptly. Certainly, this joint would never be tight.

The contractor was advised. At first he wouldn't believe it, but on being urged, he walked over to take a look at it himself. He came, he looked, he understood, he swore. A properly threaded pipe was telegraphed for ultimately, the other having been spoiled and no other piece on hand of suitable length. To be sure the contractor advised the instructor of his error, but refrained from hurting the feelings of the young man. He had the good taste to inform him on the Q.T., thus enabling dignity to be upheld, and to be fair to the instructor, I will add that he "confessed" his error to the prodigy and all others concerned to prevent a recurrence.

EFFECT OF BOILER GRAPHITE.

By C. T. R.

EVERYONE knows that to some extent all waters used for feeding steam boilers contain impurities, either in suspension or in solution. Everyone knows, too, just what happens when the impurities collect on the boiler shell and tubes in the form of scale or soft mud, in sufficient quantities to affect the steaming properties or to even seriously imperil the safety of the boiler. The explosions about which we read so frequently are nearly always caused by the failure of a scale-clogged tube, or a scale-incrusted plate that has warped to the point of rupture, or to an unsuspected crack in the shell that had been concealed by scale. The fight against scale is being stubbornly waged.

Effects of Scale.

The effect of scale in a boiler ordinarily is to reduce both its steam-generating capacity and its economy, since scale is not a good conductor of heat and, therefore, diminishes the transmission of heat through the boiler plates and tubes. Scale is also highly dangerous, for whenever it accumulates to any great extent at a part of the shell exposed to the flame or to very hot gases, it prevents the cooling action of the water from protecting the metal against burning. The plates frequently become overheated and weaken so as to "bag," crack, and cause an explosion.

Scale Removal.

Since nothing has been found to absolutely prevent the formation of scale, the only logical thing is to employ some means to easily and safely remove the scale that does form. Flake graphite has been used for this purpose for many years, and with gratifying results. The action of graphite is not chemical; it does not dissolve the scale, nor does it attack the metal; neither is it affected by acids in the water or by the heat generated in the boiler. The particles of graphite simply work into the minute cracks existing in the old, hard scale and gradually penetrate between the scale and the metal. The scale thus loosened may be rapped off or removed otherwise without trouble.

It must be understood that if the scale is very hard and thick it may require as long as three or four months for the graphite to loosen it, but once removed, scale can never adhere firmly to the metal again as long as the graphite treatment is continued. Graphite also becomes thoroughly intermixed with new scale as it forms, rendering it soft and crumbly. In short, graphite makes boiler cleaning positive and easy.

It's use minimizes the time and power lost while cleaning; increases efficiency of heating surfaces; reduces fuel consumption; minimizes repairs; improves operation of feed pumps and water meter, and prolongs the life of boilers.

The action of graphite is purely mechanical. It may be used in any feed water and in any type of boiler. It will not evaporate or dissolve. It cannot cause "foaming," nor under normal conditions can it pass from the boiler with the steam and thereby render it unfit for industrial purposes; for this reason, it finds special favor in ice plants, laundries, breweries, sugar refineries, canneries, etc.

Forms of Graphite.

It is generally conceded that graphite is a satisfactory agency for the successful removal and prevention of boiler scale, but careful consideration should be given the grade of graphite best adapted for the purpose. Graphite as found the world over, is divided into two general glasses only—flake or crystalline, and amorphous. Amorphous graphite is valuable for certain purposes, such as foundry facings, stove polish, etc., where its properties of balling-up or sticking together in masses is not objectionable. It is a fact, however, that this form of graphite, due to the physical characteristics of the particles to a certain extent forms into pasty or mud-like masses in the presence of water in a boiler, and settles on the plates and tubes. On the other hand, experience has shown that the finely pulverized thin, flake variety of graphite will be distributed evenly on the surfaces of the shells and tubes and become more permanently attached to the metal than the amorphous graphite. This means that, pound for pound, flake graphite will give at least twice the service of the other. In other words, every particle of finely pulverized, thin, flake graphite is a scale reducing particle.

Both amorphous and flake graphite are employed, but investigation shows that those who manufacture and sell both grades, recommend the finely pulverized material in preference to the amorphous, although the margin of profit is approximately the same on both.

POWER PLANT TROUBLES.

By J. E. N.

"THERE is continual trouble in our power plant," said a manufacturer, "and I am at a loss to know what to do to get things going right." "That's an easy one to answer," said his friend; "remove the cause."

In many large power plants, there is often continual trouble; sometimes it is the fault of the owner, sometimes otherwise, and for the benefit of the former I will make a few suggestions, based upon knowledge gained from personal observation and experience.

Have three shifts of eight hours each, instead of the usual 12-hour shifts, and engineers would appreciate being given the same working hours as other mechanics.

If your engineers put in daily reports, get the necessary printed forms, even for moderately small plants, as it means a considerable saving of time to the engineers if they have to write up a complete report; besides, the chances are that some of the most important items will be side-tracked. It is a great help to the engineer if he has only to fill in the figures. If a blank sheet is used, the report is more than likely to be so incomplete as to be of little real value. In large plants, of course, the printed forms for the different departments are always used.

Plant owners, managers, and chiefs should understand that an occasional word of commendation goes a long way towards making more efficient and satisfied men and, therefore, less trouble. It is not always dollars and cents that count, for a little appreciation shown by the boss to the firemen, cleaners and other employees is a sure trouble chaser, no matter how faithful this class of power plant worker be.

Do not imagine that by refusing to install labor saving appliances and compelling the men to work early and late, that you are saving money and trouble. Oh no, just the opposite. You may have good men and they may do their best, but good appliances will do things better if they get proper care.

The water should go through a purifier before it goes into the boiler, a proceeding which will save your men some work, and incidentally increase the power of your heretofore partly scaled boilers, on the same amount of or less fuel.

A wonderful trouble eliminator is the free use of recording instruments for gases, water, steam, vacuum, draft, electric power, etc. They help the chief and often prevent trouble among the staff by showing up the careless or incompetent man. They will show where losses occur, and their advantages are altogether too numerous to mention.

It is not always the chief or his men who make trouble in the plant. Sometimes the owner, manager, or superintendent is the nigger on the fence, by giving orders to the men over the chief's head or interfering in other ways.

There are other trouble makers, but the foregoing corrected, will make those that remain more easily solved.

READERS' QUERIES.

Leaky Oil Ring Bearing.—In reply to the oil ring bearing query of George Munro, on page 429 of the Oct. 30 issue of Canadian Machinery, I am of opinion that the bearing is worn, leaving, thereby, too much play, and the only remedy is to have a new one. A somewhat similar case arose in my own experience, and was treated as above advised, with the result that the trouble disappeared.—R. W. Philip.

• • •

Raising Steam Electrically.—I have a battery of eight return tubular boilers under my charge, each unit of which approximates a 200 h.p.-rating. Coal is the fuel we use and the steam generated is employed for drying purposes only. Our power requirements are met by a hydro-electric installation which produces at a very low cost and leaves us with 750 h.p. to spare. I would like to know if it is possible to use this excess electrical power for steam generation purposes in one or more of our boilers, and to have some data covering equipment details of any such arrangement at present installed.—T. P. Matthews.

Presentation.—A presentation of a beautiful chair and cuff links was tendered Mr. Chas. W. Hawthorne, superintendent of the Bloom, Billet and Rod Mills of the Steel Co. of Canada, by the employees recently. Mr. Hawthorne expressed his surprise and appreciation in an able speech of acceptance, in which he hoped they would all be together as friends for an indefinite number of Christmas seasons.

DEVELOPMENTS IN MACHINERY

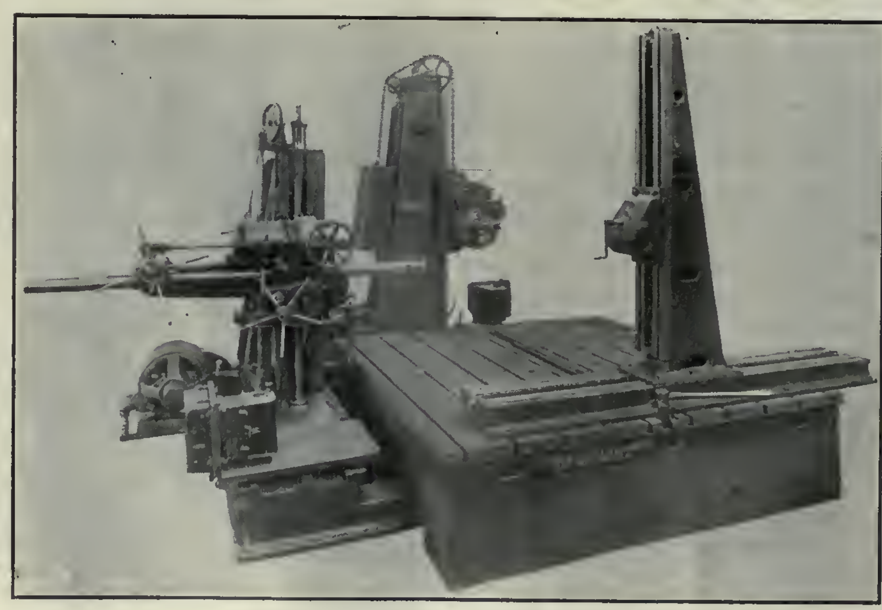
A Record of New and Improved Machinery Tending Towards Higher Quality and Economical Production in the Machine Shop, Blacksmith Shop or Planing Mill.

DUPLEX FLOOR BORING AND DRILLING MACHINE.

FOR boring and drilling heading machinery frames and handling similar work, the Detrick & Harvey Machine Co., Baltimore, Md., has brought out a Duplex Floor Boring Machine, which consists of one of the builder's standard No. 2 horizontal drilling, boring and milling machines, with a spindle saddle having a vertical travel, set at right angles to it. The runways of each machine are bolted to bed plates of any desired size and in the accompanying engraving the bed plate is shown raised to permit the spindles to be brought close to it, the distance between the spindle in its lowest position and the work bed being about 13 inches. The columns travel horizontally on the runway, the exact amount being varied in accordance with the requirements of the purchaser. The boring of the work is accomplished at a single setting and the milling, drilling, tapping or other operations can be performed on four sides with only a single additional chucking. Conveniently located levers, arranged so as to be non-conflicting, control all movements both fast and slow, of the two machines.

The spindles, which are 5 and 3½ inches in diameter respectively, are of high carbon hammered steel and are driven from the front or working end. The spindle on the No. 2 machine has a continuous feed of 36 inches, while that for the spindle on the other machine is only 24 inches. Automatic milling feeds are provided for both machines and there is an outer support for the boring bar on the No. 2 machine.

The combination is arranged for motor drive to a 10 h.p. direct-current adjustable speed motor, a range of 2 to 1 being used. All of the gears are of steel or bronze, belts having been entirely eliminated.



DUPLEX FLOOR BORING AND DRILLING MACHINE.

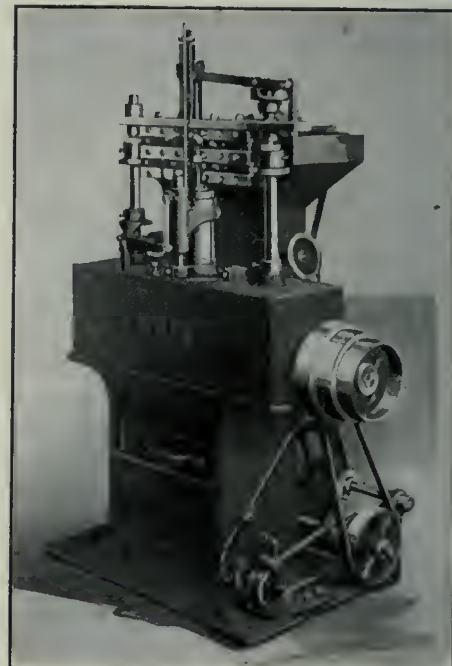
AUTOMATIC NUT TAPPER.

THE Automatic Nut Tapper here described and illustrated is a recent product of the Erie Machine Shops, Erie, Pa. This machine has no reverse motion and takes care of the tapping of units of various kinds and sizes up to 1 inch diameter. The units pass on and over the length of the tap and down through the hollow shaft to the pan below.

The tap is stationary and is held in position by two pairs of grips, opening and closing alternately to permit the nut to pass between, first, the upper, then the lower pairs. The nut passes onto the blank end first; one with a hole too small cannot get on.

The grips are of tool steel, secured to the inner end of machinery steel guides with an adjusting screw behind them to centralize the tap and to adjust for the different sizes. On the outer end of the guides or grip holders are tool steel rolls bearing on and operated by tool steel cams which are mounted on the two outer vertical shafts. There are no levers, the cams acting directly behind the grips, assuring absolute rigidity of the tap.

The nut chuck is of tempered tool steel, and revolves around the tap. It has a hole through its length the shape of the nut to be tapped, and a trifle larger. It has a vertical motion and is contained in a casing driven by a hollow shaft. At its end are a pair of grips;



AUTOMATIC NUT TAPPER.

the grips opening when the chuck is raised above the casing containing it. The nut is then placed in the chuck by means of an arm and lever operated by a cam on the top end of the right hand vertical shaft. Immediately the chuck starts down, the grips close above the nut, carrying it down until there are sufficient threads in it to relieve the tap of its heavy duty. It then rises for another. Meantime, the chuck is sufficient in length to continue to drive the nut which is being finished.

The number of threads the nut passes over on the tap before accepting another, depends on the class of work to be done. Twenty-two or twenty-three threads appear to be about right for the machine screw nuts with a full thread. For shallow threads, as in the case of stove bolt nuts, etc., the nut does not have to pass so far onto the threaded portion of the tap before accepting another, thus increasing the output without increasing the nut speed on the tap. The capacity, however, depends on what the tap will stand.

The feed is a conveyor belt travelling over the top edge of the hopper at an angle of 15 degrees. The nuts raise from the hopper on a lift and slide onto the conveyor belt. Sufficient room is provided for those that do not land flat to either right themselves or be pushed back into the hopper. Hexagon nuts are handled with the same regularity as it does the square. As in the case of all automatic machinery where there is no one immediately at hand to guard against mishaps, safety devices are very important, and these have been carefully considered.

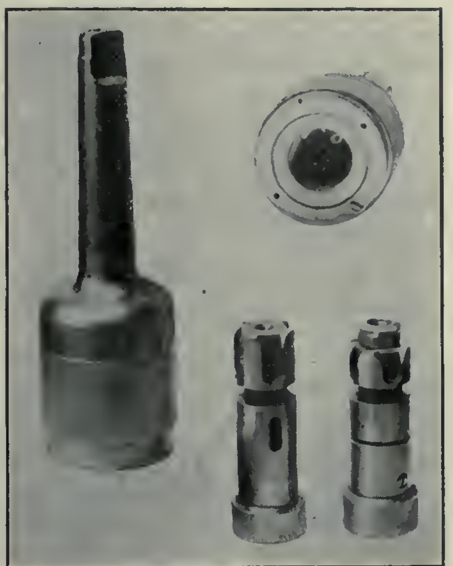
The nuts are pushed out by the conveyor belt until the foremost one is directly over the top and blank end of the tap where it rests on a pair of hinged plates held in place by two small balance weights until the starter or arm bears down upon it. The chuck driver is operated by a lever and cam on the lower left hand vertical shaft. Attached to it is a small connecting rod operating a latch which holds the starter in its topmost position, and only trips it when the driver has started down with the chuck and nut onto the threaded portion of the tap. If it should fail to go down, the starter ceases operation.

In the right hand worm gears driving the vertical cam shafts, the thrust comes on the pulley end of the driver. The pulley is secured by a feather key. On the outer end of it is a thrust washer, strong enough to drive the vertical shafts, but of sufficient weakness that if a nut with a ragged hole should land on the square of the tap between the grips as they close, the two shafts would stop simultaneous. The thrust washer will break before stripping the gears. The shaft is drawn out of the pulley until the key releases it and it runs idle. It is only necessary to dislodge the nut, push the shaft back in place, and replace the washer.

All shafts run in phosphor bronze bushings.

AUTOMATIC QUICK CHANGE COLLET CHUCK.

NEW and distinctive features of the Automatic Quick Change Collet Chuck, built by the E. Horton & Son Co., Windsor Locks, Conn., from the invention of Oscar F. Bergsten, Worcester, Mass., comprise the self-alignment of each collet on the tool steel centre, the drive independence of the retaining or locking device which results in a positive solid drive, and a locking device strong enough to enable undercutting tools to be used.



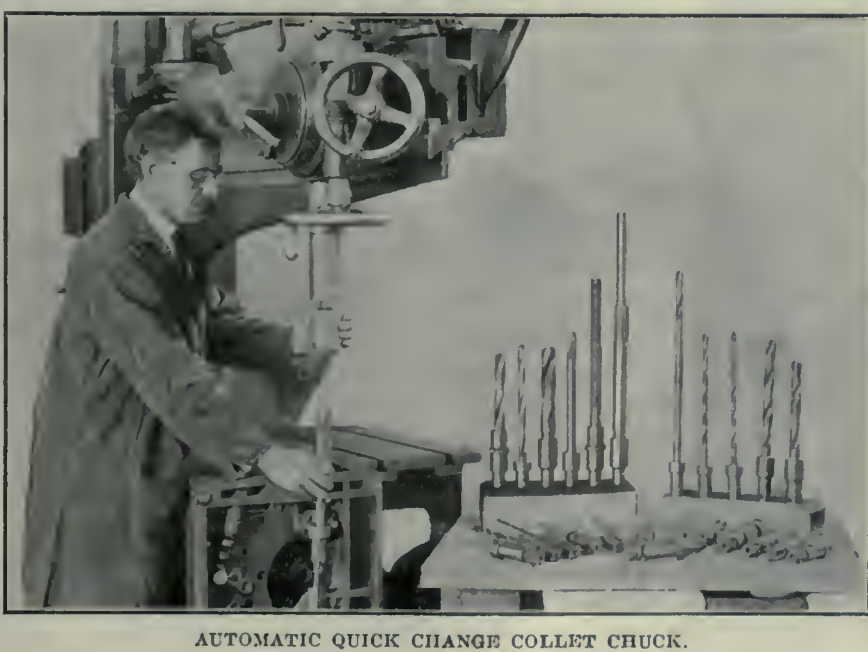
AUTOMATIC QUICK CHANGE COLLET CHUCK.

The chuck body is made of a single piece of high carbon steel, the shank being ground true with hole, and having a hardened tool steel centre in head of body. A hole is made through the shank, so that this centre can easily be driven out and replaced. The drivers are made of tool steel, hardened and ground, and will drive backward as well as forward. The locking device consists of a hardened cam, attached to a releasing collar, operating on two retaining dogs, made of tool steel, hardened and ground, and which positively locks socket when inserted. Collets can be inserted or released quickly by a slight resistance to the collar by the hand, while the machine is in motion.

The collets have a square positive drive, and are made of crucible steel, hardened and ground .013 in. smaller than hole in chuck, except centre collet, which is made to fit snugly. A cone is made in head of collet, to fit the tool steel centre of chuck.

The friction drive tap collets have a tool steel friction sleeve, hardened and ground, operating on two internal fibre cones, which give a sensitive and perfect adjustment. Blank collets are furnished unhardened, making it possible to fit them to any tool desired. All working parts are enclosed and protected from dust, and held in their proper relations by an adjusting nut at bottom of chuck. The design is such that it is impossible for operator to be injured.

Operation of chuck is effected by grasping the knurled collar and holding it back against the rotation of the spindle. This causes a pair of retaining dogs to be drawn back into the body of the chuck so that the collet can be slipped into place. The knurled collar is then released, and the action of a spring forces the dogs inward, so that they engage a groove in the collet and secure it in the chuck.



AUTOMATIC QUICK CHANGE COLLET CHUCK.

LUBRICATING GREASES

THE introduction of ground asbestos as the basic material has been an important development in the manufacture of lubricating greases. A process is patented by the Railway Asbestos Packing Co., Sherbrooke, Que., who have met with much success in the sale and manufacture of spedolene for automobile and motor trucks, axolene for axles, and asbestolene for gears of all kinds of heavy machinery and wire cables.

The greatest advantages claimed for these lubricants are that they last more than twice as long as the average grease, due to the high wearing qualities of asbestos. Since the management of the company was taken over by Mr. J. A. Tate, the business has greatly increased, and to-day their products are being sold all over Canada and the United States, as well as in Cuba and South America.

ENAMELING OR COATING STEEL AND IRON WITH GLASS.*

By Raymond F. Naylor.

(Continued from last week.)

IN the production of acid-proof apparatus, the use of a ground coat or cover coat is now eliminated and the same material which in place of being an enamel, as commonly termed, is in reality a boro-silicon glass and without the use of any metallic oxides in its compounding.

The mill additions together with the agents used in "setting up" are fused with the frit as the piece is fired. By a process similar to the above, we could compute the final composition of the enamel by taking these additions into consideration. The actual amount of material added in this case, however, is so slight and of such a nature that the change resulting therefrom is not sufficient to affect materially the composition of the enamel. When an addition of about 12 per cent. tin oxide accompanies the clay, a very significant change in the composition of the enamel is produced.

Color Production.

It may be well to note in passing some of the means by which various colors are produced in the enameling industries. It will be impossible to enter into great detail without taking too much time, but the mention of certain compounds in connection with the colors produced by their use will serve our purpose.

The production of a good white enamel either for cast-iron or sheet-steel work may be said to depend, at the present time, upon the use of tin oxide. Great have been the efforts to substitute less expensive substances, such as compounds of antimony and lead, but an antimony white which looks good alone is plainly seen to be off-color when compared with a good tin oxide white. Going to the other extreme of color, black, we encounter difficulties. There are any number of formulae for black enamels, but when the results are closely compared we find that the colors range widely through brown blacks, blue blacks, purple blacks, etc. Certain compounds of manganese and iron used together give a color approaching black. Other formulae call for the combined use of oxides of manganese, cobalt and copper. Again, we find oxide of nickel added to the above three oxides.

A color much seen in enamels is blue, and the use of cobalt is very satisfactory in the production of this color in various grades of intensity. Manganese alone produces purples and violets and in combination with cobalt gives various shades of purple-blue.

Green enamels are chiefly produced by the use of cromium oxide and copper oxide, while in some cases a mixture of copper and cobalt oxide is used. Reds of various shades are produced by the use of red oxide of iron. In connection with it we find that tin oxide aids greatly in giving opacity and bringing out the color. In the production of brown enamels we may use ferrous chromate, Various yellows are produced by salts of cadmium, chromium and uranium.

The more delicate shades of rose and purple are produced by the use of gold compounds. So-called "pink-rose" is used in the manufacture of certain artistic enamels. Perhaps the best known gold compound used in enamel coloring is "purple of Casius." The exact composition of this product is a question. It is made by the combined use of auric, stamous, and stamic chlorides. The color produced is also commonly called "purple of Casius."

Future of the Industry.

Before drawing this paper to a close, attention is invited to a general consideration of the future of the enameling industry. Neglecting art enameling and sign making we come to the field of steel enamels. So far as the cooking ware industry is concerned, the field is practically constant. Granting that the demand for that class of article is increasing, as the public becomes accustomed and educated to its use, there is an opposing tendency in the rapidly increasing use of aluminum ware. Exactly how these and other factors now balance would be difficult to ascertain, but aluminum is a metal and its metallic properties cannot be denied. Under certain conditions it is attacked by various substances used in the culinary arts and a contamination of the preparation is inevitable.

No doubt the time will come when a high silica enamel known to be free from tin and other poisonous compounds will enter the cooking ware field. The Government is becoming more and more careful in protecting the public from foods of injurious nature and it is not too much to expect that soon it will establish more rigid restrictions relative to the ingredients entering into the manufacture of apparatus in which food is to be prepared. At such a time an enamel coming up to requirement will be free from injurious compounds and will come into great demand.

In the preparation of foods on a factory scale, we find an enormous and constantly increasing demand for larger pieces of enameled steel apparatus in the form of pans, kettles, tanks, pipe, etc. There are many lines of pressure being brought to bear both by the government and public opinion which lead to the conclusion that the increasing demand for this style of apparatus is without limit. Canning and preserving factories and dairy establishments have found a large use for copper and tin in the construction of containers, vacuum pans, etc. The acids of fruit juices and vegetable pulps have a very marked action on these metals and the resulting contamination of the product is known to be of danger to the consumer. The use of an enamel containing tin, lead or other metallic oxides is but the first step in the right direction. The presence of these metallic oxides in the enamel renders it corrodible and contamination results. The solution is the use of an acid-proof enamel free from all such poisonous substances. In the milk industry a similar line of reasoning applies. Further compare the ease of maintaining sanitary conditions in a one-piece enamel lined unit with the trouble experienced in the use of a metal container or even an enameled article made up of composite parts between which are gaskets.

Another consideration relates to the preparation of chemicals later used in food products, for instance, baking powder. Many operations connected with the manufacture of such products have been carried on in lead or other metallic pans and the resulting contamination has given no end of trouble. Acid-proof enamel is rapidly solving this problem also.

Finally, consider the chemical manufacturing processes now carried on in apparatus of lead, wood and earthenware, necessitated by the corrosive actions of the liquors and gases involved. This includes the pharmaceutical field which alone is a matter of great importance. In all these and many other lines the use of acid-proof enameled apparatus is rapidly finding and filling a great demand. Not only does steel apparatus meet the demands of modern industries, but in case a cheaper product is desired and at the same time a heavier construction is permissible, acid-proof cast-iron apparatus has its field. The possibility for size and variety of construction is, of course, more limited than in the case of sheet-steel apparatus

In view of these considerations and many others which these have called to mind, we cannot but conclude that the use of enameled apparatus has just begun and with this extension of the long known art of metal enameling, a field of great industrial possibilities both for manufacturer and user has been opened. We may not be criticised as being over optimistic when we predict that in their ultimate stage of development the enamel industries will be ranked among the greatest of commercial activities. At such a degree of development the enameling industry will in no way deserve classification among the lost arts.

*From a paper read recently before the American Society of Mechanical Engineers.

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Vol. X. DECEMBER 18, 1913 No. 25

PRINCIPAL CONTENTS.

THE BRITISH CONSULAR SERVICE.

AMERICAN consuls in foreign countries keep their eyes open for opportunities for trade, and their observations are invaluable to United States manufacturers. Time and again their reports, showing new markets all over the earth, are published, and make interesting reading. They invade Canada and, perhaps more discreetly, put their countrymen in touch with trade conditions in the Dominion from one end to the other.

Canadian manufacturers must feel a little sore sometimes, that such an organization is not at their service. The truth is, there is such an organization, and a better one. It is the British Consular Service. Recently, at the invitation of the Canadian Premier, J. Joyce-Broderick, newly appointed British Consul at Amsterdam, formerly Vice-Consul at New York City, toured this country, delivering addresses before Canadian Clubs on the relation of the British Consular Service to Canada. As he pointed out, it will be some years before the factories and mills of this country over-take home requirements, but the day will come when Canadians will require an effective consular service. He had noticed while in New York, he said, that few Canadian manufacturers made enquiries for commercial information.

Canadians are apt to forget when it comes down to business, that their country is part of the British Empire, and that the consul at New York is acting for them just as much as he is acting for English, Scottish or Irish firms. It will be good for our manufacturers who are exporters, to keep this fact in mind, and to remember that the consular service reaches out and finds new markets all over the world.

MACHINE TOOLS FOR TECHNICAL SCHOOLS.

SOME time ago we drew attention to an instance where the Dominion Government was hampering technical education. The Toronto School Board had ordered certain machine tools. Some of these, it was alleged, could not be secured in Canada, and had been ordered through Toronto agents from the United States manufacturers. When the time came for the installation, it was discovered that these tools were held up in the Customs, and could not be delivered until duty had been paid. A deadlock ensued, the agents not wishing to pay the duty, as their price having been based on an understanding that machine tools required for educational purposes were allowed to enter the country duty free. As it was essential that the machines be delivered at once to allow students to pursue their studies, a compromise was arrived at between the agents and the School Board.

From the point of view of Canadian machine tool makers, the action taken by the Hon. J. D. Reid, Minister of Customs, is a favorable one, since it will result in an effort on the part of the School Board when ordering equipment for the new technical school, to choose only machine tools made in Canada. It is claimed, however, by the school authorities, that while they desire as far as possible to purchase Canadian-made tools, certain machines cannot be purchased here, and must be imported. In any case, as far as the machines ordered last summer are concerned, the matter is closed.

Some pointed remarks were made, and considerable indignation evinced at the meeting of the School Board last week when it was announced that the Minister of Customs positively refused to admit machine tools for the school, duty free. The chairman said: "Those people are trying to handicap the work that the Technical Commission are trying to build up." He added that the same machinery had been allowed to enter Winnipeg, duty free, simply because the customs officials there had put a different interpretation upon the relative clauses.

There was some talk of asking local members of parliament to assist in having the duty removed, but this was not pushed. If there is any city in Canada that can effect this through its members, it is Toronto. Failing that, all towns and cities contemplating the installation of machine tools for technical education must either buy in Canada, or pay the duty on imported machinery.

The action of the Government in this matter is in marked contrast to that of the Toronto Clay Products Manufacturers' Association, who promised to supply the Board with equipment if they would include a course in brick-making in the school curriculum.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

	Mont'l.	Tor'to.
Grey Forge, Pittsburg.	.....	$14 15
Lake Superior, charcoal, Chicago	.....	15 25
Middlesboro, No. 3	20 00	21 50
Carron, special	24 25	.....
Carron, soft	24.25	.....
Cleveland, No. 3	20 00	22 00
Clarence, No. 3	20 50	21 00
Jarrow	.....	23 50
Glengarnock	......	26 00
Michigan charcoal iron.	25 00	.....
Ferro Nickel pig iron (Soo)	.....	25 00
Victoria, No. 1	19 40	18 35
Victoria, No. 2X	19 15	18 10
Victoria No. 2 Plain	18 90	17 85

BILLETS.

	Per Gross Ton.
Bessemer billets, Pittsburgh	$20 00
Open hearth billets, Pittsburgh	20 00
Forging billets, Pittsburgh	24 00
Wire rods, Pittsburgh	25 50

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto	2.00
Steel bars, f.o.b., Toronto	2.05
Common bar iron, f.o.b., Montreal.	2.10
Steel bars, f.o.b., Montreal	2.15
Bessemer rails, heavy, at mill	1.25
Steel bars, Pittsburgh	1.25
Tank plates, Pittsburgh	1.20
Beams and angles, Pittsburgh	1.25
Steel hoops, Pittsburgh	1.40
F.O.B., Toronto Warehouse.	**Cents.**
Steel bars	2.20
Small shapes	2.30
Warehouse, Freight and Duty to Pay.	**Cents..**
Steel bars	1.70
Structural shapes	1.80
Plates	1.80

Freight, Pittsburgh to Toronto.

18 cents carload; 21 cents less carload.

IRON PIPE FITTINGS.

Canadian malleable, 40 per cent.; cast iron, 65; standard bushings, 70; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 77½; malleable, lipped unions, 65.

NAIL AND SPIKES.

Standard steel wire nails, base..		$2 30
Cut nails	$2 60	2 65
Miscellaneous wire nails...		75 per cent.
Pressed spikes, ⅝ diam., 100 lbs.		2 85

BOILER PLATES.

	Mont'l.	Tor'to.
Plates, ¼ in., 100 lbs.	.....	2 20
Heads, per 100 lbs.	2 65	2 55
Tank plates, 3-16 in.	2 40	2 30
Tubes, per 100 ft., 1 inch	9 50	8 50
" " 1¼ in.	9 50	8 50
" " 1½ "	9 50	9 00
" " 1¾ "	9 50	9 00
" " 2 "	8 75	8 75
" " 2½ "	11 15	11 50
" " 3 "	12 10	12 50
" " 3½ "	14 15	14 50
" " 4 "	18 00	18 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Stove bolts	80 & 7½
Machine bolts, ⅜ and less	65 & 10
Machine bolts, 7-16	60
Blank bolts	60
Bolt ends	60
Machine screws, iron, brass	35 p.c.
Nuts, square, all sizes	4¼ per lb off
Nuts, Hexagon, all sizes	4½ per lb off
Fillister head	25 per cent.
Iron rivets	60, 10 p.c. off
Wood screws, flathead, bright	85, 10, 7½, 10 p.c. off
Wood screws, flathead, Brass	75, 10, 7½, 10 p.c. off
Wood screws, flathead, bronze	70, 10, 7½, 10 p.c. off

Milled Products.

Sq. & Hex. Head Cap Screws	65 & 10%
Sq. & Hex. Head Cap Screws	65 & 10%
Rd. & Fil. Head Cap Screws	45-10-10%
Flat & But. Head Cap Screws	40-10-10%
Finished Nuts up to 1 in...	75%
Finished Nuts over 1 in....	72%
Semi-Fin. Nuts up to 1 in..	72%
Semi-Fin. Nuts over 1 in...	72%
Studs	65%

Discounts, f.o.b., Montreal.

OLD MATERIAL.

Dealers' Buying Prices.	Mont'l.	Tor'to.
Copper, light	$10 00	$11 00
Copper, crucible	12 00	12 25
Copper, uncr'bled, heavy	11 50	11 50
Copper wire, uncre'bled.	11 00	11 50
No. 1 machine compos'n	10 50	10 75
No. 1 comps'n turnings..	9 00	9 00
No. 1 wrought iron	9 00	8 00
Heavy melting steel	7 00	8 50
No. 1 machinery cast iron	13 00	12 00
New brass clippings	8 50	8 75
No. 1 brass turnings	7 25	7 50
Heavy lead	3 75	4 00
Tea lead	3 00	3 00
Scrap zinc	3 00	3 50

WROUGHT IRON PIPE.

The following are Toronto jobbers' discounts on pipe in effect from April 21, 1913:

	Buttweld		Lapweld	
Standard	Black	Gal.	Black	Gal.
¼, ⅜ in.	64	49	....	....
½ in	68	58	....	....
¾ to 1½	73	63	....	....
2 in.	73	63	69	59
2½ to 3 in.	73	63	72	62
3½ to 4 in.	71½	61½	70½	60½
4½ to 6 in.	....	....	71½	61½
7, 8, 10 in.	....	....	66	54
X Strong P. E.				
¼, ⅜ in	56½	46½	....	....
½ in.	64	54	....	....
¾ to 1½ in.	68	58	....	....
2 to 3 in.	69	59	....	....
2½ to 4 in.	....	....	66	56
4½ to 6 in.	....	....	64	56
7 to 8 in.	....	....	55	45
XX Strong P. E.				
½ to 2 in.	43	33	....	....
2½ to 4 in.	....	....	43	33

PRICES OF WROUGHT IRON PIPE.

Standard.		Extra Strong,		D. Ex. Strong,	
Nom. Diam.	Price. per ft.	Sizes Ins.	Price per ft.	Size Ins.	Price per ft.
⅛in	$ .05½	⅛in	$ .12	½	$. 32
¼in	.06	¼in	.07½	¾	.35
⅜in	.06	⅜in	.07½	1	.37
½in	.08½	½in	.11	1¼	.52½
¾in	.11½	¾in	.15	1½	.65
1 in	.17½	1 in	.22	2	.91
1¼in	.23½	1½in	.30	2½	1.37
1½in	.27½	1½in	.36½	3	1.86
2 in	.37	2 in	.50½	3½	2.30
2½in	.58½	2½in	.77	4	2.76
3 in	.76½	3 in	1.03	4½	3.26
3½in	.92	3½in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4½in	1.27	4½in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.86	...	.....
7 in	2.38	7 in	3.81	...	.....
8 in	2.50	8 in	4.34	...	.....
8 in	2.88	9 in	4.90	...	.....
9 in	3.45	10 in	5.48	...	.....
10 in	3.20	....	.....	...	.....
10 in	3.50	....	.....	.....	.....
10 in	4.12	....	.....	...	.....

METALS.

	Mont'l.	Tor'to.
Lake copper, carload	$16 00	$16 25
Electrolytic copper	15 25	15 75
Casting copper	15 10	15 60
Spelter	5 25	5 25
Tin	40 50	40 00
Lead	5 25	5 25
Antimony	8 50	8 50
Aluminum	21 00	21 00

SHEETS.

	Mont'l.	Tor'to.
Sheets, black, No. 28	$2.85	$2.90
Canada plates, ordinary, 52 sheets	2.75	3.00
Canada plates, all bright	4.00	4.15
Apollo brand, 10¾ oz. (American)	4.30	4.20
Queen's Head, 28 B.W...G.	4.40	4.40
Fleur-de-Lis, 28 B.W.G.	4.20	4.25
Gorbal's Best, No. 28	4.40	4.40
Viking metal, No. 28	4.40	4.40

MISCELLANEOUS.

	Cents
Putty, 100 lb. drums	$2.60
Red dry lead, 5 cwt. casks, per cwt.	6.00
Glue, French medal, per lb.	0.10
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.26
Benzine, per gal.	23½
Pure turpentine	0.60
Linseed oil, raw	0.60
Linseed oil, boiled	0.63
Plaster of Paris, per bbl.	2.10
Plumbers' Oakum, per 100 lbs.	3.25
Pure Manila rope	0.17

COKE AND COAL.

Solvay Foundry Coke	$5.95
Connellsville Foundry Coke	5.20
Yough, Steam Lump Coal	3.88
Penn. Steam Lump Coal	3.68
Best Slack	3.05

All net ton f.o.b. Toronto.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents.

Montreal, Dec. 15, 1913.—The principal local event of the past week was the completion of the preliminary bore of the Canadian Northern Railway tunnel through Mount Royal. Gangs of men working from both ends met early on Wednesday morning last after fifteen months and four days of boring, the tunnel having been commenced on September 6, 1912.

Amid the gloom of present business conditions the highly encouraging annual report of the Canadian Car & Foundry Co., Ltd., issued last week, came as a pleasant refreshment. For the year ending September 30th last the company, with its subsidiaries, earned a gross total of $2,351,325. After providing for sinking fund, depreciation and all other requirements and after paying the usual 7 per cent. on the preferred stock, a balance of $1,371,653 was left available for dividends on the common stock—a sum equivalent to 23 per cent. The gross sales for the year amounted to $20,300,000, as compared with $16,500,000 last year and $12,500,000 in 1911; or an increase in business in two years of over 65 per cent. Owing to the present lull in trade activity the orders now on the books, however, are not as heavy as they were twelve months ago and business is expected to be dull during the present winter. The completion of the company's Fort William plant is, therefore, not being rushed, though matters are so far advanced that the plant could be placed in commission at short notice as soon as conditions justify such a step.

The machinery trade remains very quiet. Mussens, Ltd., who are sales agents for the Vulcan Locomotive Co., Wilkesbarre, Pa., have secured an order for four locomotives for the Dominion Dredging Co., Ltd., who will use them in connection with their contract for Section No. 1 of the new Welland canal.

The recent fall in the price of Nova Scotia Steel & Coal Co. stock gave rise to rumors last week that a fresh issue of capital was contemplated. The report has to-day been emphatically denied by Mr. R. E. Harris, President of the company, who states that they have all the funds they require for present needs.

Toronto, Ont., Dec. 16.—Pessimism pervades the Canadian steel market. Some admit it openly, and say: "Things are standing stock still, and we predict a bad winter;" others observe: "We do not join in the cry of bad times coming. We believe that business will be good again by spring. Of course, we admit business is bad just now, but—"

One of the leading agents for steel expressed the opinion this week that there was hope in the fact that in the States there had been no heavy buying for the past nine months, and no one had big stocks. "Does the same condition hold here?" he was asked. "Unfortunately, it does not," he replied. "Nevertheless, this is a factor which will determine the price of steel in the States, and also in Canada. The stocks of steel held in Toronto are enormous, especially by structural steel men."

This remark is not so true of manufacturers, especially outside of Toronto, who have allowed their stocks to drop very low, and have been replenishing them from warehouse. This has been the salvation of the steel men this year—the large sales from warehouses of steel bars.

Drop in Steel Bars.

A point of great interest this week is a drop of five cents per lb. in the price of steel bars and small shapes, Toronto warehouse, which occurred on Monday. Steel bars, structural shapes, and plates (warehouse, freight and duty to pay) also dropped five cents, last Thursday. This is the result of the drop in mill prices some time ago, the effect now being felt. A drop in the warehouse prices does not, as a rule, result in more business, as the demand there is only to fill requirements. A drop in mill prices does, as a rule, result in better business.

The people who are buying steel just now are manufacturers who can provide money for building extensions, and are using their own help to fabricate the steel. If they were busy, they would order it ready fabricated. Manufacturers who use steel are not inclined to contract for it even at present prices.

Seamless Tubes.

Tubes are one of the few steel products that have not followed the general downward tendency. The tube mills have kept pretty well filled up, and although there have been demands for lower prices, these were not conceded. There is a steady demand for tubes from warehouse all winter, but there is little demand for plates or heads. Recent inspections for Government officials have resulted in better business in tubes. The demand now is more for seamless tubes rather than of the lap weld tube.

About fifty per cent. of the foundries in Ontario are either closed or are running light, and very little pig iron is selling. It is a remarkable thing, however, that the demand for coke during the past few weeks has been good. Foundries in the city, which are mostly operating, are ordering coke freely. Most of them realize, it is thought, that deliveries being poor in winter, it will be best to get in a good supply.

Foundries Feel It.

A manufacturer of cast iron pipe returned to Toronto this week, after closing his foundry in Winnipeg, and from the look of things, expects to close his Toronto foundry for two months after Christmas. Business in Winnipeg he reported as fair, but further west, building was slacking off, and indicated a late spring opening. There is this good feature, he said, that most people in the West, in all lines, had been working off their stocks, and must buy afresh.

Asked why the crop in the West had not improved matters, he stated that if the crop last year had not been a good one, Canada would have experienced the worst year she ever had. As it was, there was enough money to tide things over.

The foundry business in Toronto, he said, had been exceptionally good up to last month, but had gradually been falling off, which was usually looked for, more or less, at this time.

There are quite a lot of small orders for machine tools. The Tube & Pipe Bending Co. of Ontario, 10-12 Croft St., Toronto, have equipped a new shop with machine tools, including lathe, shaper, drill, grinder, hack saw, blower and furnace. They made their own special bending machines.

The Massey-Harris Co. bought a lathe, drill presses and a shaper from the A. R. Williams Co. and other machinery from the Canadian Fairbanks-Morse Co. These will be used in their toolroom at Toronto. The latter also sold A. B. Ormsby, Ltd., Toronto, a milling machine. The C.N.R. have purchased several tools for their shops at Trenton. The Welland Foundry & Machine Co., makers of hoisting engines, bought several large machines. Pilkingtons', Ltd., the glass makers, who are building at Thorold, gave the A. R. Williams Co. their order for machine tools and supplies. The Computing Scale Co., off Royce Ave., Toronto, bought several tools, and the Holden-Morgan Co. bought several machines.

FINANCE DEPARTMENT STATISTICS.

THE official figures of Finance Dept. for November show a net falling off in revenue of $742,797 as compared with November of last year, while expenditures on Consolidated Fund Account increased by $1,054,298, and the Capital Account by $2,114,710. The increase in the National Debt during the month was $1,987,657. At the end of the month, the net Public Debt of the Dominion stood at $303,115,195.

For the eight months of the present fiscal year the total revenue has been $114,640,295, an increase of $4,204,920. Expenditures show a total increase of nearly $25,000,000. Expenditures on Consolidated Fund Account total $66,678,967, an increase of $7,225,731. Expenditures on Capital Account total $36,980,369, an increase of $17,770,222. A considerable proportion of the increase in Capital Expenditures is in railway subsidies, which totalled $15,114,908, as compared with $3,938,772 for the corresponding period of last year. The greater proportion of the railway subsidies have gone, of course, to the Canadian Northern Railway.

The November Customs Revenue totalled $8,101,626, a decrease of $1,372,324, as compared with November of last year. For the eight months of the fiscal year, the total Customs Revenue has been $75,001,109, a decrease of $1,033,966. The Excise Revenue for the eight months totalled $14,620,431, an increase of $526,450. Post Office Revenue totalled $7,675,000, an increase of $675,000. The Revenue from Miscellaneous sources increased by $2,627,038. One of the largest items of increase was in the Revenue from Chinese Immigration, the total amount of the poll taxes collected during the eight months being no less than $2,230,276, which means that about 4,500 Chinese have entered since April 1.

WORKMEN'S ACCIDENTS.

UNDER the title of "Falls of Workmen and Their Prevention," the Wisconsin Industrial Commission, Madison, Wis., has issued shop bulletin No. 4, reviewing accidents due to these causes. Nearly one-half as many accidents as occurred on all machines were due to falls of workmen. The bulletin covers the period from September 1, 1911, to March 1, 1913, or 18 months. Of the total number of accidents causing disability of more than seven days, 1,387, or 13.2 per cent., were caused by the falls of workmen. The distribution is as follows:

Down stairs	52
From ladders	141
From scaffolds, tramways, trestles, runways, platforms	292
Down elevator shafts	28
Into vats, bins, holes, trapdoors, trenches, etc.	105
From piles, poles, machines, boxes, etc.	127
From buildings	45
From wagons, cars and other vehicles	204
Slipping, stumbling and jumping	393
Total	1,387

Most of these accidents were of a serious nature, 48 resulting in death, 425 in fractured bones, and 30 in serious internal injuries. In many cases, the bulletin says, these accidents might have been avoided by better shop lighting and proper application of safety appliances. Better organization, inspection, instruction of men, and more care on the part of workmen would have prevented most of the other accidents.—Iron Age.

Catalogues

The McCroskey Reamer Co., Meadville, Pa., have issued new catalogue No. 4, dealing with high grade tools and specialties for the machine shop. Some of the most prominent of those described are adjustable reamers, expanding mandrils, chucks and collets. A detailed description is given of each with illustrations showing their construction, together with principal dimensions, capacity and price. The catalogue concludes with a list of customers. B. Whittaker, 21 State St., New York City, is the export agent, from whom copies may be obtained.

The Orenstein-Arthur Koppel Co. have issued an attractive catalogue No. 900, dealing with their products. The catalogue is divided into nine parts, each describing some special product, the principal being dump and industrial cars, industrial tracks, switches and turntables, dump buckets, etc. Each type is illustrated and chief dimensions given, the illustrations being numbered and indexed in addition to the general index. The illustrations and reading matter are clear and well arranged. The Canadian Fairbanks-Morse Co., Ltd., Montreal, are the Canadian sales agents, and will be pleased to send copies to interested readers.

The Cincinnati Electrical Tool Co., Cincinnati, O., have sent us a copy of their latest catalogue No. 6, illustrating and describing fully their improved line of "Cincinnati" portable electric drills and grinders. The catalogue is arranged in two parts, part 1 being devoted to electric drills and part 2 dealing with electric grinders. All the machines are made for either d.c. or a.c. current of any phase. A specification is given covering the principal features embodied in their construction together with clear cut illustrations of the various types. Tables are included giving code word, weight, speed and capacity, etc., of each type. A partial list of users is also given. Copies of this catalogue will be mailed on request.

Samuel Austin & Son, Cleveland, Ohio, Industrial engineers and builders, have published a book dealing with the "Austin Method" of factory design, erection, equipment and maintenance, the idea back of the method being that better results can be obtained by the employment of one organization to plan and carry on the work instead of several, thus avoiding divided responsibility. The company specialize in this class of work and have three methods of handling it, according to its nature and the wishes of the owner. Each method is fully described and the book contains several excellent photographs of buildings erected under the "Austin Method." This is a handsome production, the photographs and reading being well arranged and enclosed within a substantial binding. Copies of this book will be sent to interested readers.

Sandstone, Alta.—Ceramics, Ltd., will build a plant for the manufacture of face brick, hollow ware, vitrified clay products, etc. Natural gas will be used. John Steinbrecher, president.

J. Orr Callaghan of the Steel Company of Canada, and **B. H. Prack,** of Prack & Perrine, architects and engineers, Hamilton, were in Fort William last week in connection with the Steel Co. new plant under construction.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Engineering

Winnipeg, Man.— Leopold Levinson has taken over the business of Schmidt & Co., brass founders and makers of fittings.

Hamilton, Ont. — The International Harvester Co. will have sufficient work to keep its present staff at work all winter.

Deseronto, Ont.—The Standard Iron Co., Ltd., will spend $50,000 on an extension to its plant if assured of a fixed assessment.

Caledonia, Ont.—Logan & Sons are preparing plans for the erection of new machine shops and a foundry, and will require new equipment.

Toronto, Ont.—The warehouse of H. A. Drury & Co., agents for steel, was damaged by fire on Wednesday, Dec. 10, to the extent of $2,000.

Brantford, Ont.—The Massey-Harris Co. are erecting an addition to their paint room, at a cost of $3,000. A. J. Cromar is the builder.

Dundas, Ont.—Pratt & Whitney Co., of Canada state that they will not require any new equipment for the hardening room they are erecting.

Calgary, Alta.—The Trussed Concrete Steel Co., Ltd., Walkerville, Ont., has been incorporated to do business in Alberta, with a capital of $500,000.

Toronto, Ont.—The Monarch Brass Co., 278 Dundas Street, will erect a brass foundry, for which plans are drawn. James Sherlock, owner and contractor.

Galt, Ont.—The plant of the Galt Knife Co., referred to last week, is under construction. The following departments will be equipped:—Forge, grinding room and boiler house.

Kingston, Ont.—The Canadian Locomotive Co. are about to start the erection of a one-storey machine shop, costing $68,000, of steel construction. It will be 278 feet in length.

Toronto, Ont. — Fire on Dec. 9 did damage amounting to $1,000 at the foundry of Galloway, Taylor & Co., 36 Pearl St. Besides damage to the building, the motor was destroyed.

Tottenham, Ont.—The Coleman Fare Box Co., recently incorporated in Ontario, will carry on business at Tottenham in the plant formerly owned by the late J. H. Coleman, with head offices at 70 Bond Street, Toronto. A. A. Burrows, Toronto, manager.

Vancouver, B.C. — The Compressed Gas Co., Ltd., are installing large oxygen making machinery in their plants at Calgary and Vancouver. The new plant at Vancouver will be ready early next year.

Orillia, Ont.—The council has offered to lend $50,000 to a German company, give them a site, and fix their assessment if they erect a 2-storey factory 250 x 125 ft. in size, costing $50,000, and employ 100 hands.

Waterloo, Que. — Efforts are being made to induce the Bedford Mfg. Co., makers of scythes, axes, etc., of Bedford, Que., to locate here. Their plant was burned down a week ago.

Walkerville, Ont.—The Diamond Mfg. Co. advise that they have taken 5,000 sq. ft. floor space in the Power Bldg., and are equipping it with modern machinery. D. B. Lee, general manager.

Toronto, Ont.—The new plant of the National Cash Register Co., which will contain a considerable amount of machine tools and special machinery, is about two-thirds completed, and should be ready for occupation by May.

Toronto, Ont.—W. J. McGuire, Ltd., plumbers, will erect a two-storey brick factory at 91-97 Jarvis St., costing $33,000. This will be used for plumbing and heating work, and will have a large machine shop in connection.

Fort William, Ont.—As a result of the temporary lull in business, the Canadian Car and Foundry Co., will not rush to completion their new Fort William car shops, but will have them in such a state that they could be easily placed in commission.

Guelph, Ont. — The Guelph Pattern Works have recently moved into new and larger premises in Guelph, and are taking up the manufacture of snap flasks, bench rammers, and other moulding equipment. They made their first shipment last week.

London, Ont. — The Grobb Manufacturing Co., Ltd., will add buildings and plant to the London Foundry costing $50,000, and employ 110 hands. Voting on by-law, Dec. 29. They have orders in hand for $90,000 worth of product, and will use 75 to 90 h.p. Hydro-Electric power.

Port Mann, B.C.—The foundations for the Canadian Northern Railway machine shops and roundhouse are being rushed, the Imperial Construction Co. having 200 men at work. Foundations for the roundhouse are practically completed. A new wharf will be finished in a week or two.

Hamilton, Ont.—D. M. Cameron, president of the Cameron Island Syndicate, Ltd., has an option on the plant of the defunct Hoeffner Refining Co., for the erection of a smelter to obtain cobalt from the ore now being discarded at Cobalt. Tests are now being carried out by the Dominion Government.

Halifax, N.S.—The Nova Scotia Car Works have received several orders and the plant will start up immediately. The orders given are sufficient to keep the works in operation till the middle of March. Work on the foundation of the new foundry has been finished and the structure will be pushed as fast as possible to completion.

Montreal, Que.—Geo. A. Savage, curator, will receive tenders up to December 26 for the purchase of the material and supplies, machinery, rolling stock etc., separately or en bloc, of the Amesse Foundry, 144 Wellington St. Curator at 232 St. James Street.

Winnipeg, Man.—Good Roads Machinery Co., capital $200,000, was incorporated in Manitoba last week. Provisional shareholders: William Ernest Clark, manufacturer; James Smith, ditching contractor; Benjamin Clement, mechanical engineer; all of Winnipeg.

Preston, Ont.— The Metal Shingle & Siding Co., advise that they already have a fully equipped plant at Saskatoon, which they intend to enlarge, though perhaps not until things improve. Some machinery will be required next year for the manufacture of specialties. C. Dolph, Preston, president.

London, Ont.—The George White & Sons Co., London, Ont., makers of agricultural and general machinery, have just completed the erection of a repair department at Moose Jaw, Sask. They will build a warehouse there next spring. This branch will ultimately be equipped for assembling and repairing.

Weston, Ont.—The Toronto Structural Steel Co. have practically completed their plant here, and expect to start operations on the first of the year. They make steel buildings, bridges, etc., and have orders for three months' work. Mr. Nicholson, general manager. The Toronto plant will be retained for city work.

Windsor, Ont.—The Remington Arms-Union Metallic Cartridge Co., who are erecting a new plant here advise that much of their new equipment will be furnished by their Bridgeport plant. As regards regular machine shop tools, they are unable to anticipate future requirements at present. Chas. A. Bradley, Gen. Mgr.

Fort William, Ont.—The city has agreed to have the cast iron pipe ordered for next summer, manufactured immediately by the Canada Iron Corporation. This order consists of 1,600 tons, ranging in size from 8 inches to 18 inches, costing about $72,000. This will enable the plant, which was to be closed down for the winter through lack of orders, to continue operation for a few months.

Bedford, Ont.—The Bedford Mfg. Co., Bedford, Que., makers of scythes, axes, etc., whose plant was recently burned, advise that pending the rebuilding of their plant, they have arranged with other manufacturers to take care of their orders. Their handle manufacturing department was saved. They will erect a much larger plant in Bedford. F. D. Walsh, manager.

St. Catharines, Ont.—The Russell-Jennings Co., an American concern, makers of augers, auger bits, and other tools and hardware, have purchased the old Spring Factory on Vine Street, and will build a plant having a payroll of $10,000 annually. The factory will be enlarged. The council have given the first reading to a by-law granting them a fixed assessment of $2,000 for ten years.

Woodstock, Ont.—The Concrete Machinery Co. are asking the city to lend them $20,000 to concentrate their business here, and extend it for the manufacture of new lines. The Companies to be amalgamated are: The Mitchel Crusher Mfg. Co., Toronto, and The Woodstock Windmotor Co., Woodstock. The new concern will be capitalized at $150,000. Voting on the by-law takes place Jan. 3.

Sault Ste. Marie, Ont. — Notice is given of the surrender of the charter of four subsidiary companies of the Lake Superior Corporation of Sault Ste. Marie. These are: The Algoma Steel Co., the Algoma Commercial Co., the Sault Ste. Marie Pulp & Paper Co., and the Algoma Iron Works. All these companies have been consolidated in the new Algoma Steel Corporation, whose charter is wide enough to enable the operations of each to continue and accordingly the old charters have been surrendered.

Sydney, C.B.—The Dominion Iron & Steel Co. is preparing to instal a new heating furnace in their rolling mill, with a view to developing an output of soft steel in addition to the many other products manufactured at the works. It was at first intended to establish a number of extra soaking pits in the blooming mill, but it was finally decided to adopt the furnace idea for the soft steel production. New tables are also to be put in the rolling mill. These and other preparations are to be undertaken in order to meet an anticipated large demand in the immediate future for the company's products.

Midland, Ont.—The Midland Malleable Iron Co., Ltd., advise that they will erect a plant, 100 x 500 ft., of reinforced concrete fireproof construction; walls 18 ft. high, with roof of corrugated asbestos material. It will be completed by February 15, and will employ 150 hands. Plans are now being prepared. The equipment will consist of specially designed 15-ton and two 24-ton annealing ovens, a core oven, with 300 sq. ft. rack space, and eleven machines, including tumbling mills, grinders, band saws, rip saws, lathes, drill presses, forges, moulding machines, and electric motors for individual drive throughout. H. Kreitner, manager.

Electrical

Ayr, Ont.—Ayr council has signed an agreement to take Hydro-Electric power.

Brampton, Ont.—The question of the new fire alarm system to be installed next summer is being discussed.

Waterloo, Que.—The Brome Lake Electric Power Co. have asked the corporation to give them a contract for ten years.

Montreal, Que.— The city will spend $9,000 on electric and gas fixtures, $6,000 on new meters, and will buy 100 alarm boxes.

South Vancouver, B.C.—The council are considering the installation of 50 fire alarm boxes of the Gamewell type, at a cost of $10,300.

Fort William, Ont.—The Kaministiquia Power Co. are at present completing an extension to their plant, bringing the capacity up to 30,000 h.p.

Calgary, Alta.— The Calgary Power Co. are now completing the installation of their fourth unit, thus increasing their capacity to 19,000 h.p.

Dundas, Ont.—Work has commenced on the construction of a hydro-electric transmission line to Ancaster. Power will be supplied from Dundas.

Quebec, Que.—The shoe factory of Tourigny and Marois was completely gutted by fire on Monday, with a loss of $200,000. Insurance $80,000.

Asquith, Sask.—A deputation recently visited Langham to inspect the electric light system with a view to installing a similar plant here.

Peterborough, Ont. — The Otonabee Power Co., urged the council last week to renew their franchise for ten years from Jan. 1. The franchise was refused.

Stonewall, Man.—The town has made a contract for light and power with the Winnipeg Electric Light Co. Light was turned on last Friday.

Calgary, Alta.—The Eau Claire Lumber Co. will instal two gas-driven electrical generator units, which will develop 1,500 kilowatts, and two large turbines at a cost of $300,000.

Prince Rupert, B.C.—The ratepayers will be asked to ratify an agreement with the Ritchie-Agnew Power Co., and to authorize the expenditure of $40,000 on a waterworks extension.

Fredericton, N.B. — The Eal River Light, Heat and Power Company have offered to supply electrical power for the public services in Fredericton, at the rate of 2 cents per kilowatt on a long-term contract.

Red Deer, Alta.— Conferences have taken place between the city and the Western General Electric Co., with a view to the purchase of the latter's plant. The city's financial position would not permit of the deal being closed.

Toronto, Ont.—The reduction in rates for Hydro-Electric domestic and commercial lighting will not take place just now, and perhaps not until the steam reserve plant has been installed. The rates for street lighting will probably be reduced.

Welland, Ont. — A by-law providing for a fire alarm system, costing about $5,000 will be submitted to the ratepayers in January. The Fire, Light and Water Committee is negotiating with The Northern Electric Co., and the Fire Protective Co. of Toronto.

Toronto, Ont.—The Hydro-Electric Power Commission has made a contract with the Ottawa and Hull Electric Co. for 20,000 h.p., for 33 years, with a graduated reduction from $14.

Quebec, Que.—The Dominion Textile Co. will erect a new mill and make a large extension to its present mill at Montmorency Falls. The work will be commenced next summer, and will cost in the vicinity of $750,000, Harold F. Mills, manager, Montmorency Falls.

Markham, Ont.—Representatives of the municipalities interested in the construction of a "Hydro" radial railway from Toronto to Markham and Port Perry met in the offices of the Hydro-Electric Power Commission last week, and decided to go ahead with the preliminary organization of the scheme.

Havelock, Ont.—The Seymour Power Co. offer to supply the town with power at $15 per h.p. at Healey Falls, the town to build and equip the transmission line. It is estimated that $2,000 would be required, and if the cost does not exceed that sum very much, a by-law will be prepared and voted on at the January elections.

Bolton, Ont. — The Hydro-Electric Commission has offered to supply the village with power at $44.61 per horsepower. Woodbridge and Thistledown are also anxious to get power, and the Weston Water Power & Light Co. has made a bid to the commission for the contracts and extensions in connection with the new line, as they have the nearest distributing sub-station.

Montreal, Que.— The present power house on the Lachine Canal has been found inadequate, and will be replaced by a new one, on an adjacent site, at Cote St. Paul locks. The foundation will be rushed now so as to allow completion before next summer. The machinery installed will be large enough to take care of the increasing demands of the canal. D. O'Brien, superintendent of the Lachine Canal, Montreal.

Vancouver, B.C.—The Western Canada Power Co., will raise the dam at Stave Lake, and have ordered two new 13,000 h.p. hydro-electric generating units, one to be delivered in the spring, and one in 1915. The lines of the Company now stretch throughout the Fraser Valley, and to Bellingham, Wash., where they supply 6,000 h.p. to the Puget Sound Light & Traction Co. R. F. Haywood, Vancouver, general manager.

Toronto, Ont.—The construction of a new double circuit power line between Niagara Falls and the main transmission station at Dundas, the doubling of the present line between Dundas and St. Thomas by way of London, and the enlargement of half a dozen sub-stations, all to cope with the expansion in the consumption of power, have been practically decided upon by the Ontario Hydro-Electric Commission.

General Industrial

Amherst, N.B.—The Canada Beverage Co. plant, valued at $20,000, suffered a serious loss by fire on December 6.

Calgary, Alta.—Pilkington Bros., glass manufacturers, are contemplating the erection of a plant here costing $150,000.

Fort William, Ont.—The Plymouth Cordage Co. have had representatives in this city looking for a site on which to erect a warehouse.

Toronto, Ont.—The machinery of Colby & Co., 186 Adelaide St. W., book rule manufacturers, was considerably damaged by fire on Tuesday, Dec. 9.

Granby, Que. — The Council have agreed to assist the International Tire Co. in re-establishing a plant for the manufacture of automobile tires.

Hamilton, Ont.—The National Gas Co. are negotiating for the sale of stock to the value of $175,000. The laying of pipes will not be commenced until the spring.

London, Ont.—S. F. Lawrason & Co., soap manufacturers, who were offered inducements to leave the city, have decided to stay, and expand their plant next spring.

Belleville, Ont. — M. Robinson, of Guelph, Ont., will take over the old Quinte Laundry building, and instal equipment for a creamery, to start in January.

Welland, Ont. — The Empire Cotton Mills will erect a new duck fabric mill early in the spring, in which a new type of weaving machinery will be installed.

Woodstock, Ont.—The Canadian Oak Tanning Co., in which Thornton's, Ltd., of Brantford, are interested, will erect a plant here. They are capitalized at $100,000.

Welland, Ont.—The Toronto Cotton Mills, capitalized at $200,000, propose to erect a mill here costing $1,000,000. L. T. Decourt, Boston, is the trustee of the company.

Edmonton, Alta.—A syndicate has been formed here with a capital of $50,000, to establish a malting and brewing plant at Fort Fraser, B.C. A site has already been secured.

New Westminster, B.C.—The Pacific Chocolate Co. has been reorganized, R. L. Cliff being the new president. New lines will be manufactured and extensions made in the near future .

Toronto, Ont.—Ernest W. Gill, jewelry manufacturer, 186 Adelaide St. W., suffered loss to his stock and machinery by fire last week. P. B. Wallis & Son, leather goods makers, suffered loss in the same fire.

Vancouver, B.C.—A. L. King, Edinburgh, representing the James M. Davidson & Co. Fisheries, informed the Board of Trade last week that this firm would erect a fish fertilizer plant on the coast near the Skeena River, costing $100,000.

Toronto, Ont. — Damage by fire amounting to $25,000 was done on Dec. 10 to the following plants situated at 441 King street west:—Reilly Mfg. Co., $15,000; Victoria Paper & Twine Co., $7,000; R. A. Drury & Co., $2,000; and the rest to the building, owned by Lt.-Col. Cowan. The Reilly Mfg. Co., make whitewear, and their machinery will require overhauling.

Shipbuilders Going to Ottawa.—Delegates of the Canadian Shipbuilders' Association are to meet at Ottawa before the opening of Parliament, to urge upon Government the necessity of giving serious consideration to the question of shipbuilding in Canada. H. F. Bullen, of Victoria, the vice-president, will represent British Columbia; Messrs. Lindsay and Miller, of Toronto, will represent Lake interests, and Messrs. Davie and Black the Atlantic Coast. It is said that the association will have the support of the different boards of trade throughout tthe Dominion, who may also send delegates to the conference with the Government.

Refrigeration

Calgary, Alta.—A municipal packing plant, in which the C.P.R., the G.T.P. and the C.N.R. are interested, will be considered by the council early next year.

Winnipeg, Man.—The Manitoba Cold Storage Co., Winnipeg, has applied for power to increase its capital stock from $500,000 to $1,000,000 in order to increase the capacity of the plant.

Fredericton, N.B.—Arthur C. Corfield, George N. Kennealy, Percy W. Wetmore, William W. Corfield and John M. Robinson, St. John, are applying for incorporation as the New Brunswick Packing Co., Ltd. Capital, $99,000. Head office, St. John.

Wood-Working

Yarrow, B.C.—J. H. Maddaugh, Vancouver, is building a shingle mill here.

Sarnia, Ont.—F. F. McGibbon & Sons are making additions to their planing mill and lumber yards.

Plessisville, Que. — Taschereau & Frere, manufacturers of axe and pick handles, have dissolved.

Vancouver, B.C.— Foley, Welch & Stewart, contractors, Vancouver, are considering the erection of a saw mill near Newport, B.C.

Wingham, Ont. — Walker & Clegg, manufacturers of upholstered goods, will make an extension to their plant, and are asking the town for a loan.

Toronto, Ont. — The plant of J. M. Loose & Sons, Carlaw avenue, piano action makers, has been purchased by Frank Loose, who will make additions for the manufacture of pianos.

Stratford, Ont.—The Classic Furniture, Ltd., are building a plant for the manufacture of high grade bedroom furniture. New machinery is being installed.

Montreal, Que.— J. P. Dupuis, Ltd., Verdun, Que., has been incorporated with a capital stock of $300,000 by Joseph P. Dupuis, George N. Monty and others to manufacture doors, sashes, etc.

New Toronto, Ont.—A. T. and W. J. Thompson are laying foundation for a new planing mill, two-storey, 50 by 54 feet, with carpenter shop above. Five electrically-driven machines will be installed.

Chatham, Ont.—The firm referred to last week as contemplating the erection of a match factory here, is Somers Bros., Saginaw, Mich., makers of the well-known Saginaw match. The ratepayers on Monday last, voted against granting this company a bonus. Consequently they will build elsewhere.

New Incorporations

The Central Garage and Electric Co., Ltd., has been incorporated in New Brunswick to do business at Moncton, N.B. They will repair both automobiles and electrical machinery.

J. R. Baxter & Co., Ltd., incorporated at Ottawa, capital $75,000, to manufacture all kinds of hardware and machinists' supplies, etc., at Montreal, Que. Incorporators: John R. Baxter, William J. W. Booth, etc., Montreal.

P. L. Schmidt Hardware, Ltd., incorporated at Ottawa, capital $50,000, to manufacture hardware and cutlery at Montreal, Que. Incorporators: Alastair M. Fisher, John Pritchard, etc., Montreal.

Consumers' Fish and Cold Storage Co., Ltd., incorporated at Ottawa, capital $50,000, to store fish and manufacture ice at Yarmouth, N.S. Incorporators: Elmer E. Prior, Maurice P. Shaw, etc., Yarmouth, N.S.

Solo Player Piano Co., Ltd., incorporated at Toronto, capital $40,000, to manufacture, buy and sell player piano actions, pianos, etc., at Clinton, Ont. Incorporators: Paul V. Rohl, Frederick J. Hill, etc., Clinton.

Hepworth Silica Pressed Brick Co., Ltd., incorporated at Toronto, capital $125,000, to manufacture and sell pressed silica brick, core and building sands, at Hepworth, Ont. Incorporators: James Douglas, James E. Campbell, etc., Hepworth.

Canadian Elevator Equipment Co., Ltd., incorporated at Toronto, capital $100,000, to carry on in all its branches the business of manufacturing, installing and erecting elevator accessories of all kinds, at Toronto. Incorporators: George H. Sedgewick, James Aitchison, etc., Toronto.

Tenders

Hamilton, Ont.—The National Steel Car Co. is still negotiating with the Grand Trunk for the contract to be closed next week for a thousand steel cars. The general expectation is that the Hamilton concern will be favored.

Ottawa, Ont.—Tenders will be received for the construction of the Chaudiere Falls, on the French River dam up to the afternoon of December 29th. The proposed improvements will provide for a depth of twenty feet.

Winnipeg, Man.—Tenders addressed to the chairman, Board of Control, will be received up to December 26th, for the construction of an ice-breaker and navigation fender at the Louise Bridge. Plans, specification, etc., from city engineer, 223 James Avenue. M. Peterson, secretary.

Ottawa, Ont.— Tenders in duplicate addressed one copy to the city clerk, City of Ottawa, Canada, and the other to Sir Alex. Binnie, Son & Deacon, St. Stephen's House, Westminster, London, England, and endorsed "Tenders for steel pipes," will be received until Tuesday, February 3, for about forty-two miles of welded steel pipe, fifty-four inches internal diameter, for about forty-two miles of welded steel pipe fifty-eight inches internal diameter, and about eleven miles of welded steel pipe, fifty-one inches internal diameter. Form of tender and specification may be obtained from Sir Alex. Binnie Son & Deacon, St. Stephen's House, Victoria Embankment, London, S.W., or from the City Engineer of Ottawa, Canada, on and after December 15, on receipt by them of a cheque to the value of five hundred dollars made out to the City Treasurer of the City of Ottawa, Canada, which sum will be returned on receipt of a bona fide tender.

Municipal

Cote, Sask.— The municipality will spend $12,000 on building roads. R. J. M. Parker, reeve.

Brome, Que.—The town will secure a loan to construct twenty miles of macadam road.

Port Colborne, Ont.—The village of Humberstone is in the market for a fire engine, costing $3,500.

Port Alberni, B.C. — The city will spend $40,000 on a waterworks. Voting on by-law took place Dec. 11.

Tilbury, Ont.—The ratepayers are considering a by-law to provide $6,000 for the extension of the water mains.

Quebec, Que.—The Council has voted $150,000 towards the erection of a grand stand for the Quebec Exposition.

Sarnia, Ont.—The Council have made an agreement with the village of Point Edward to supply water from its new waterworks at cost.

Wallaceburg, Ont.—The town may buy the plant of the Wallaceburg Gas Co., and will submit a by-law to the ratepayers in January.

New Toronto, Ont.—The council will instal a pumping station at the foot of Ninth street, with five miles of mains, at a total cost of $75,000.

London, Ont. — Greene, Swift, Ltd., have applied to the city for permission to lay and maintain pipes for conducting steam to the inhabitants. Voting on by-law, Dec. 29.

Fort William, Ont.—The city will raise $30,000 for acquiring and equipping a stone quarry near Mount McKay, and an extension of the street railway to it. Voting on by-law December 31.

Hamilton, Ont.—A letter from the Secretary of the Fire Underwriters' Association recommending that the pumping equipment of the city be duplicated, has been referred to the city engineer.

London, Ont.—South-western municipalities are insisting that the natural gas to be supplied by the Natural Gas Co. be purified first. The pipe lines from the Tilbury fields have just been completed.

Port Moody, B.C.—This municipality will obtain a water supply from Noon Creek, and have applied to Coquitlam Council for permission to divert part of the water from Scott Creek into Noon Creek.

Railways—Bridges

Cornwall, Ont.—The council are considering a grant of $5,000 to the Stormount and Glengarry Railway.

Peterborough, Ont.—At the January elections, the ratepayers will be asked to vote $78,000 for a bridge over the Otonabee river at Dalhousie street.

Toronto, Ont.—The new Gerrard St. Bridge will cost between $182,000 and $198,000 more than the $200,000 which has been appropriated for it by the city.

Montreal, Que. — The first train ran through the C.N.R. tunnel on December 10, carrying a number of distinguished guests. The headings were only joined on the day previous.

Edmonton, Alta.—Two parties of surveyors are in the field on the route of the Alberta & Great Waterways Railway, and construction work will begin in a few days at a point 12 miles north of this city.

Ottawa, Ont.—The St. Lawrence and Ottawa Railway will cost from $7,000,000 to $8,000,000. Work on the Brittania line will start next summer, and on the Morrisburg and Ottawa branch in the spring.

Sarnia, Ont.—The village council at Point Edward has agreed to exempt from taxation an elevator if the Grand Trunk erects such a structure there to replace the one destroyed by fire last autumn.

Forest Hill, Ont.—The promoters of the Forest Hill Electric Railway Co. are preparing their plans for an early start in the spring. It is expected that the surveyors will commence operations within a week.

Hamilton, Ont.— The Hamilton and Mountain Park Ry. Co. have been ordered by the Railway Board to prepare plans and specifications for the reconstruction of the incline railway at Wentworth street. The work must be done immediately.

Barrie, Ont.—At a special meeting of the town council, held December 12, a provisional agreement with the Toronto, Barrie & Orillia Electric Railway Co. was adopted and a by-law prepared for submission to the qualified ratepayers on January 5. The company gets a twenty-five-year franchise and a fixed assessment of $15,000 for general taxation.

Victoria, B.C.—Eight new bridges are being built by the Government and three renewed. One at Tagun near Nelson, will cost $90,000; and will be finished by May. Hodgson, King and McPhalen, Vancouver, are contractors, and the Northwest Steel Co., Vancouver, will supply the steel. The government are contractors for a bridge across the North Thompson River, 40 miles west of Kamloops. Three bridges are being erected across the Eagle River, between Sicamaus and Revelstoke, and a new bridge is being erected at Terrace, on the Skeena River. Renewals are to take place at Clayton's Bridge at Penticton, and at Athalmar.

St. Catharines, Ont.—The St. Catharines city council has been assured by vice-president Hanna that the first portion of the Toronto-Niagara River line of the C.N.R. system will be in operation between St. Catharines and Grimsby within two years.

Regina, Sask.—The Government will guarantee $1,000,000 bonds for the Canadian Northern Saskatchewan Railway for terminals and bridges in the city of Moose Jaw. The work is to be completed with diligence and to the satisfaction of the Government who have arranged for a union depot between the G.T.P. and C.N.R. In return the C.N.R. are to have running rights to Regina over the new G.T.P. line just completed.

Marine

West Vancouver, B.C.—The West Vancouver ferry board has approved plans submitted by Cartwright, Matheson & Co. for the reinforcement of the wharf at the foot of Fourteenth Street. D. L. 237, at a cost of $20,000.

Building Notes

Hespeler, Ont.—The city will erect new municipal buildings at a cost of $25,000.

Toronto, Ont.—Acting City Architect F. W. G. Price has been asked to prepare plans for a one-storey addition to the city hall.

Toronto, Ont.—James O'Neill, of the St. Charles Hotel, will erect a three-storey hotel at the corner of Bay and Richmond Streets.

Winnipeg, Man.—A new hostelry will be built on the site of the Leland Hotel, owned by E. J. Rochon, costing about $300,000.

Toronto, Ont.—The Dominion Bridge Co. have purchased steel in England for the Royal Bank Building, and will commence work on December 20.

Quebec, Que.—C. W. Lindsay, Ltd., piano makers, Montreal, have acquired the Houghton property on St. John St., and will build a 5-storey building.

Trade Gossip

The Swansea Smelting & Refining Co., Ltd., have surrendered their charter.

The Western Car and Equipment Co., Ltd., Winnipeg, will hold their annual meeting Jan. 13.

Vancouver, B.C. — Damage to the amount of several thousand dollars was caused by a fire on December 12 at the Lulu Island shingle mill.

Goderich, Ont.—The Goderich Planing Mill Co. will increase the size of its plant if the town will guarantee its bonds for $15,000.

The Wells Pattern & Machine Works, Ltd., Jarvis Street, Toronto, is the name chosen to take the place of Wells Adjustable Chaplet Co., Ltd.

The Pratt & Letchworth Co., Brantford, Ont., one of the subsidiary concerns of the Canada Car & Foundry Co., Montreal, have increased their tonnage fifty per cent. in the past year.

J. E. Bennett, of Ker-Ben Ltd., Almonte, is suing the Hamilton Stove and Heater Co. for balance of $2,902.32 alleged to be owing for services performed.

The Canadian Car and Foundry Co., Montreal, will close down their plant on December 20, to allow it to be overhauled. This is the first time this has been possible in eight years.

The Gray Mfg. Machine Co., Toronto, have recently received an order for three 7½ x 4½ x 10 in., high duty, outside packed steam pumps, also for six 5 x 6 in. duplex power pumps.

The Ontario Railway and Municipal Board has delivered a judgment to the effect that Toronto city engineer has the right to say what type of rail the street railway company shall lay on the streets.

The Canadian Warren Tool Co., St. Catharines, have won out in an action brought against them by a local firm of electricians for $640, for wiring done. The defence was that the charge was exhorbitant.

The Steel Company of Canada did business for the first half of the year amounting to $1,108,233, the largest in its history. Even with the unfavorable conditions of the last half of the year, the company will, it is expected, improve on the showing of 1912.

The International Harvester Co. have stocked their warehouse at Fort William with 15,000,000 lbs. of harvesting machinery, 5,000,000 lbs. of binder twine, and expect to receive more before navigation closes . These stocks will be forwarded to Western points during the winter.

The Ontario Municipal Electrical Association have organized an engineering section, which will hold meetings at intervals, at which the purchase of supplies, the organization of departments, and other technical matters will be discussed.

The Ontario Municipal Electrical Association, which is composed of officials representing the various municipalities using Hydro-Electric power, decided at its annual meeting in Toronto City Hall last week to pay the members of the Ontario Hydro-Electric Power Commission $25,000 a year.

The National Steel Car Co., Hamilton, are contemplating building a new type of street car, one with steps at the middle instead of the end. Some of the more progressive companies on the other side are using this style of street car, and the Hamilton concern thinks there should be a good demand for such in Canada.

New Locomotives.—The Grand Trunk Railway has decided to build 75 new Mikado locomotives for use in Canada and the United States. Twenty-five only will be used in the latter country. The new Mikados will cost $30,000 each. The total amount, therefore, means an expenditure of $2,250,000. The locomotives will be of the most improved type.

Montreal, Que.—A winding up order has been granted on the petition of Henry Percy Douglas against Douglas-Milligan, Ltd., agents for building specialties. Alex. Robertson, chartered accountant, and Edward M. Watson, accountant, have been appointed joint provisional liquidators. Petitioner is creditor to the extent of $96,432 in cash loans to the firm.

The Dominion Iron and Steel Co. has declared a regular quarterly dividend, payable on January 2. At the meeting of directors on Friday last, J. H. Plummer, president, stated that orders on their books were almost up to regular business. He admitted that things would be slack for two months, but believed that by spring there would be good business again.

George A. Marshall has recently opened an office at 70 Lombard Street, Toronto, as manufacturers' agent, representing Wm. Atkins & Co., Sheffield, England, makers of various brands of steel for machine tool and other services. Mr. Marshall is also handling the "Fire King" sprinkling shovel for locomotive, marine and stationary steam boiler firing, being a new line on the Canadian market.

The Independent Pneumatic Tool Co., Chicago, Ill., have recently made arrangements with W. H. Rosevear & Son, Winnipeg, Man., to sell the Thor air tools in the Provinces of Manitoba, Alberta, and Saskatchewan. A complete line of air drills and pneumatic hammers, as well as repair parts, will be carried in stock by W. H. Rosevear & Son for delivery direct to users in their territory.

The Frost Wire Fence Co., Hamilton, Ont., has for years made a practice of sending its most energetic agents for trips to various parts of Canada. The route proposed for 1915 is through Western Canada, down the Pacific Coast to the Panama Exposition at 'Frisco. "Does it pay?" some one asked H. L. Frost, on learning that the firm provided the best Pullmans and every comfort. "We don't do it for fun," was the reply.

New G.T.R. Cars.—In addition to 18 Mikado type locomotives recently received from the Montreal Locomotive Works, the Grand Trunk have received the following cars: In Canada—691 box cars, from Canadian Car & Foundry Co., Turcot, Que.; 313 box cars, from Eastern Car Co., New Glasgow, N.S. In United States—479 box cars, from Western Steel Car & Foundry Co., Hegewisch, Ill.: 286 gondola cars, from Pressed Steel Car Co., McKees Rocks, Pa.

The National Steel Car Co., Hamilton, held their second annual smoking concert at the Germania Club on December 9, at which the heads of the departments and office staff were present. L. A. Rodger, assistant secretary-treasurer, presided, and said that since operations began in January last, 3,000 cars had been turned out. Among those who took part in the musical programme were C. R. Dillon, superintendent; Michael Burns, machine shop foreman; H. Cooper, foreman of paint shop; E. I. Pooler, foreman of the woodworking department, and O. D. Southwaite, chief clerk to C. R. Dillon. Mr. Basil Magor, general manager, was unable to be present.

The Graton & Knight Mfg. Co.—Owing to the increased demand in Canada for their products, the Graton & Knight Mfg. Co., Worcester, Mass., makers of Neptune and Spartan Waterproof Leather Belting have established a branch in the Unity Bldg., 46 St. Alexander St., Montreal, where they carry a complete stock of leather belting and lace leather. They have also installed in these premises a 36-in. and 40-in. belt press, with other necessary machinery to build and repair large or small belts. It has always been the policy of this company to maintain competent repair departments in connection with its various branches, and the one connected with the Montreal branch is fully equipped to give patrons prompt and efficient service.

Personal

William Deering, founder of the Deering Harvester Co., died at Miami, Fla., Dec. 9.

P. Ford-Smith, Hamilton, sailed last week for England, where he intends to spend a holiday.

A. D. Smith, formerly with the Western Electric Co., has been appointed electrical inspector of Fort William.

Andrew Schmidt, who for 32 years has been connected with the firm of Schmidt & Co., brass founders, Winnipeg, has retired.

Peter Gordon, manager of the Tuttle & Bailey Mfg. Co. plant at Welland, left last week for Winnipeg on a business trip.

Hyman Miller, a Winnipeg wholesale hardware merchant, who died in Los Angeles in January, 1912, left an estate of $1,188,679.

H. S. Holt, president of the Montreal Light, Heat and Power Co., is in the Montreal Isolation Hospital suffering from scarlet fever.

Douglas Vickers, a member of the British firm of Vickers, Ltd., who are building a shipbuilding plant at Montreal, is visiting in this country.

Thomas Cantley, general manager of the Nova Scotia Steel and Coal Co., was at Ottawa last week, with Robert E. Harris, K.C., and returned to New Glasgow at the week end.

To Our Readers—Greetings

THIS issue of "Canadian Machinery" is dated December 25th. By this, as by a score of other tokens, you will know it is Christmas Day.

¶ We would like to meet you all personally and wish you sincerely the compliments of the season, but, being unable to accomplish the impossible, we must ask you to accept the snirit for the deed.

¶ This number of "Canadian Machinery" brings to a close the most successful year in the history of that publication, ending, as it does, its first volume in weekly form.

¶ We have striven to serve well and to merit the confidence of mechanical men and manufacturers. How well we have succeeded is for you to judge, but we believe our efforts have not gone unappreciated, and that we have been privileged to interest all and help not a few.

¶ About to enter, as we are, upon a year of potentiality, we emphasize the possibilities for profit that will be presented in each issue of "Canadian Machinery." We bespeak a careful perusal of every number that you may miss nothing and gain much; that you may be made more efficient and more completely informed upon subjects of vital importance in your work; that you may have a wider knowledge and a broader view; and that your earning power and your profits may be increased.

¶ Not only to the editorial pages do we invite your constant attention, but to the equally important preceding and succeeding pages as well—the advertising sections. Here, many of the keenest and most progressive buyers turn constantly for guidance, for information and for ideas. Here are represented the best and most reliable manufacturers, and in dealing with them you have the assurance of satisfaction in both quality and service.

¶ These manufacturers spend their money freely and judiciously that you may easily become familiar with their products. They are not afraid to get out in the clear and revealing light of publicity, because their lines can stand the most searching examination and scrutiny. You owe it to yourself to buy and use advertised goods.

¶ As we said before, we are entering upon a New Year, and, in thanking you for your support in the past, we wish you prosperity in the future, and much of it. We are preparing to do our part, and if you will do yours—the part we cannot perform for you—1914 and the years to follow will be great indeed.

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Vol. X. DECEMBER 25, 1913 No. 26

PRINCIPAL CONTENTS.

NOTICE TO OUR READERS.

FOR your convenience, we have punched a hole in the upper left hand corner of this issue of Canadian Machinery, and suggest that a cord be inserted so that the number can be hung up in a convenient place in your den or office for ready reference. The Postal Regulations do not permit of us inserting the cord on account of a privileged mailing rate, but we have gone as far as is possible in an effort to co-operate with you in conserving the contents against future requirements.

RETROSPECT AND PROSPECT.

IN these closing days of the year 1913, there exists considerable divergence of opinion relative to the arrest of the trade depression tendency and to the prospects of relief from the prevailing money stringency. Canada, of course, is not alone a victim with respect to these matters, her peculiar situation as a new country in process of populating and development being more or less responsible, due to her necessary dependence for capital with which to open up her agricultural and mineral resources, and her need of the products of other countries to effectively and economically prosecute the work.

Forecasting the immediate future is after all largely guesswork, at the same time there is considerable fascination in the exercise, and no great harm, but much good usually accrues, except when pessimism is played for the sake of notoriety. The progress of the past year is such as to inspire optimism in all of us, and it is worthy of note that the record of growth and development which each succeeding twelve months is piling up makes more stable our foundations commercially, and consequently less susceptible of outside influences.

Canadian Trade.

The statement of Canadian trade for the month of November issued a few days ago by the Hon. J. D. Reid, Dominion Minister of Customs, shows that the total was $111,459,000 as compared with $106,072,000 for November, 1912. For the 8 months of the present fiscal year, ending November 30, the total Canadian trade was $777,624,000, as against $713,614,000 for the corresponding 8 months of the fiscal year 1912.

The export figures are decidedly interesting. Domestic agricultural products exported in November last totalled $33,417,000, as against $24,175,000 for the corresponding month of 1912. Exports of domestic animals and their produce was $7,795,000; and for the corresponding month of 1912 these exports were $4,939,000. The exports of manufactures for November also show a substantial and healthy increase; they were:—Domestic manufactures, $4,841,000, as against $3,830,000 for November, 1912. There is also a substantial increase in the exports of products of the mine, fisheries and forest.

For the 8 months of the present fiscal year ending November, the exports of agricultural produce easily take the lead. During this period domestic agricultural exports were $142,338,000, and for the corresponding 8 months of the last fiscal year these were $96,349,000.

During the 8 months of the present fiscal year the exports of domestic animals and their produce was $38,824,000, compared with $33,949,000 for the corresponding period of 1912. The fisheries were never in a more flourishing condition. For the 8 months of the present fiscal year we exported of domestic fish 13,556,000, compared with $10,499,000 for the corresponding 8 months of 1912.

Imports for November, exclusive of coin and bullion, were $50,202,000, made up as follows: Dutiable goods, $32,338,000; free goods, $17,863,000. For the corresponding month of 1912 the imports were: On dutiable goods, $38,471,000; free goods, $20,846,000—making a total of $59,318,000. The imports for the 8 months ending November 30 were: Dutiable goods, $294,635,000; free goods, $146,111,000—making a total of $440,746,000. For the corresponding 8 months of 1912, the imports of dutiable goods were $293,319,000 and of free goods $152,231,000, making a total of $445,550,000.

The grand total exports for November were $57,762,000 and the grand total imports of dutiable and free goods $50,202,000. During the month of November last we imported $1,814,000 of coin and bullion and the imports of coin and bullion for the 8 months ending November 30 were $5,422,000, compared with $3,634,000 for the 8 months of the previous fiscal year.

One of the most pleasing exhibits made by these figures is the fact that Canada's exports are increasing so rapidly. No doubt, the huge crop in the West has contributed a large quota, but an examination of the various classes of exports shows that there has been considerable expansion over many departments.

Railroad Development.

During the present year a large increase in mileage under construction and in operation falls to be recorded, and, concurrently, the features of rolling stock and contributory equipment and the opening up of new territories to agricultural, mineral, and general industrial development, combine to make the achievement still more marked.

Whatever be the degree of financial stringency, the railways are bound to keep up their efficiency to the highest possible standard. Slackness or indifference in this direction would be fatal. Figures show that the C.P.R., the Grand Trunk and the Canadian Northern have between them ordered 1,000 locomotives during the past twelve months, together with 43,000 freight cars.

This, in turn, relates to other big things. For instance, the wheat acreage has increased in Manitoba during the past ten years 1,000,000 acres, or 48 per cent.; in Alberta, for the same period, 1,520,000 acres, or 4,647 per cent.; in Saskatchewan, 4,235,000 acres, or 48 per cent.; and in the total wheat area in the Western Provinces, 6,768,000 acres, or 269 per cent.

Work on the G.T.P.-National Transcontinental railroad has been pushed forward on an extensive scale during the year and what is true of laying steel applies also more or less to the preparations made to care for the rolling stock and equipment. At Transcona, near Winnipeg, the locomotive repair plant has been in operation, while the car plant is rapidly nearing completion. At Prince Rupert, B.C., the Western terminal, drydock construction, marine and locomotive plants show material development. Plans have also been prepared and contracts let for the locomotive and car repair shop of the Eastern division at St. Malo, near Quebec, and during the coming year tenders will be sent out and contracts placed for the engineering equipment. Work on the Quebec Bridge which forms part of the Eastern section of the N.T.R. is being pushed forward, and while completion of the structure will be somewhat later than the opening of the railroad for traffic, provision has been made to meet this eventuality by the letting of a contract to Cammell, Laird & Co., Birkenhead, England, for a ferry vessel capable of taking a full train aboard. This craft will be launched towards the end of January, 1914, and will bear the name "Leonard," after the N.T.R. Commissioner.

Our third Transcontinental, the Canadian Northern, has been no laggard in the matter of accomplishment during 1913, and when we stop to consider the magnitude of and cost involved in the work of throwing a track of steel across a continent, there is naturally aroused a secret admiration for the men whose enterprise and determination make possible the achievement.

The Dominion Government Railway, perhaps better known as the Intercolonial, operating from Montreal through the Maritime Provinces to Halifax has, during the year, spent much in the improvement, both of its repair plants and rolling stock, and it is not overstraining the point, when we state that at no time in its history has this railroad been in such good shape.

Montreal Grain Export.

The export grain trade from the port of Montreal for the season 1913 has been a record one. The total shipments of all kinds of grain amount to 54,305,172 bushels, as compared with 38,918,264 for the season 1912, showing the handsome increase of 15,286,908 bushels, which to a large extent may be attributed to the remarkable improvements made within the past few years in the facilities of handling grain at the port. The elevator capacity has been increased considerably, and this, coupled with the cheaper all-water rates for grain from Fort William and Port Arthur and the splendid service obtainable from the different Lake lines of steamers, induced exporters to forward all the grain they possibly could by way of Montreal. Notwithstanding these facts, some very large quantities were also exported via United States ports.

The Steel Trade.

Considerable inconvenience was felt throughout the year by most people engaged on general and structural engineering work, through delays in steel deliveries from the mills, the latter having been easily loaded up beyond their capacity. The above mentioned conditions are, however, now less acute, due to the money stringency and consequent easing up of business generally. Dissatisfaction is still expressed with the inaction of the Dominion Government relative to the matter of bounties or tariff imposts for the support of the various steel concerns throughout Canada and general expectations are that something really helpful in one or other of these directions will materialize in the course of the ensuing year.

Workmen's Compensation.

The report of the Province of Ontario Commissioner, Sir Wm. Meredith, on workmen's compensation indicates, from the expressions of opinion by what might be termed opposing interests, that not only will a more or less bitter fight be waged when the Bill for enactment comes before the Legislature, but that some more rational means of arriving at a mutually satisfactory solution of the necessarily knotty problems involved might have been adopted.

Representative Manufacturing Plants.

This issue of Canadian Machinery contains a series of articles descriptive of representative manufacturing concerns intimately allied with the trade and practice of mechanical engineering, and serves to show the extent and scope of the work undertaken. Developments of note during the year in the matter of new industries and product, are exemplified in the "Leonard" vertical, forced lubrication, quick revolution engine; the manufacture of hack saws, two plants having been established, one in Hamilton and one in Montreal. Twist drill manufacture has come to the front during the year, the companies interested being the John Morrow Screw Co., the Wilt Twist Drill Co., and the Armstrong-Whitworth Co. Electric Welding machinery and equipment manufacture by the Fisher Motor Co. and the Agnew Electric Welding Co., both of Walkerville, Ont., are industries to which 1913 has also given birth.

General.

The succesful boring of the tunnel through Mount Royal by the engineering staff of the C. N. R. and the completion of the C. P. R. bridge across the St. Lawrence at Highlands, near Montreal, can be reckoned as among the Dominion's great engineering feats during 1913.

INDUSTRIAL NOTABILITIES--No. 14

ARTHUR WILLIAM WHEATLEY, Vice-President and General Manager of the Canadian Locomotive Co., Ltd., Kingston, Ont., and previously connected with many of the most important railroads of America in various capacities, covering a period of seventeen years experience, was born October 12th, 1870, at Ashford, Kent County, England. He is a son of William Wheatley, who is still doing business in England as an iron founder, and of Agnes (Holly) Wheatley, both of English birth and ancestry. After receiving an ordinary education in the railroad schools of Kent County, England, young Wheatley, at the age of fifteen years, began as a rivet boy in the shops of the South Eastern Railroad, and in 1887 apprenticed himself as a fitter, attending night school—operated by the railroad company.

In 1892 he went to the United States, and soon found employment with the Northern Pacific Railroad at Brainerd, Minn., as machinist. In 1893 he was transferred to Staples, Minn., in the like capacity. In 1895 he was made foreman, occupying that position until 1900, when he was transferred to Livingston, Mont., as general foreman. In December, 1902, he was promoted to master mechanic of the Yellowstone division, headquarters at Glendive, Mont.

In June, 1903, he was appointed shop superintendent at Brainerd, Minn., and in April, 1904, was made general master mechanic of the entire system of the Northern Pacific Railway. About February, 1905, he accepted a position on the Rock Island Railway as shop superintendent at

ARTHUR WILLIAM WHEATLEY.

Moline, Ill., and in June, 1906, he became assistant mechanical superintendent on the Union Pacific Railroad, with headquarters at Omaha. In June, 1907, he entered the employ of the American Locomotive Co. at Schenectady as general inspector of the various plants, and in December of the same year was transferred to Montreal as manager of the American Locomotive Co. plant in that city.

In November, 1910, he was transferred to Dunkirk, N.Y., being in charge of that plant until June, 1911, when he received and accepted an offer from the Canadian Locomotive Co. at Kingston, Ont., and was chosen as Vice-President and General Manager of that large corporation, a position he ably fills at the present writing.

Mr. Wheatley was married July 1, 1894, to Eleanor Daglish Edwards, of Brainerd, Minn., and the union has been blessed by two sons, Henry William Wheatley, and Arthur Walker Wheatley.

Mr. Wheatley is a member of the St. James Club, Montreal Club, Engineering Club of Montreal, Royal St. Lawrence Yacht Club of Montreal, Frontenac Club of Kingston, and of the Masonic Fraternity, being a Knight Templar and a Shriner. He resides in Kingston, and his principal recreation is golf.

Rebuilding the Canadian Locomotive Works - Kingston, Ont.

Staff Article

What follows shows how a thoroughly modern locomotive works is being evolved from a plant that was constructed long before the lay-out of industrial plants had become the almost exact science that it is to-day. It is interesting to note that, so far from falling behind, production has actually been materially increased during the reconstruction of these shops.

THE works of the Canadian Locomotive Co., Ltd., at Kingston, Ont., are the oldest in Canada devoted to locomotive construction, dating back more than sixty years. They were established in 1850 and were taken over by the present company, organized by Mr. Aemilius Jarvis, of Toronto, in 1911.

A large amount of money has been spent in the modernization of the plant, and where the production two years ago was barely six engines per month it is at the present time twelve; and when the improvements and betterments which are now being proceeded with are completed, the output will be increased to twenty-five locomotives per month.

The problem of how best to remodel the works was one beset with difficulties. not the least of which was the restricted nature of the site of the existing plant. This site, however, it was decided to retain, as it is possessed of several important advantages. It has excellent track connections with the Grand Trunk Railway and lies on the shore of Lake Ontario, with unloading slips on two sides of the plant, enabling raw material to be brought in by water.

The first step in rebuilding was to get out plans for the new shops to be erected over and around the old ones, that being the only way in which production could be continued during the alterations. This work was entrusted to the firm of Henry Goldmark, consulting engineers, New York. The preparation of detail plans and specifications and the carrying out of the work is in charge of Mr. C. J. Goldmark, a member of the firm. Good progress has been made, the new carpenter and pattern shop, pattern storage, foundry, tank and tender shops being now completed. The pits in the new erecting shop are also built and the foundation work finished; and erection of the steel work is now going forward. A plan of the works as they will eventually appear is shown, and from this the relative positions of the different shops can be clearly seen.

The Pattern and Carpenter Shops.

This is the latest shop to be completed, and went into operation in October last. It is a one-storey building with brick and concrete walls, steel frame, steel roof trusses and purlins, and 3-inch wood roof. It measures approximately 193x60 ft.One-half of this space is used by the carpenters and the other half by the pattern-makers, the two sections being separated by two dry kilns and a boiler room which occupy the middle of the shop. Large steel sash windows and glass skylight give good natural lighting, mercury vapor lamps being used after dark. The building is heated by a hot blast system, a motor-driven Sturtevant fan distributing air heated by steam raised in a return tubular boiler. The latter is fired entirely by shavings, scrap lumber, etc. All machines are fitted with exhaust hoods over the cutters, or where this is not feasible, with floor sweep openings. In this way shavings and sawdust are carried to a dust separator above the boiler room roof, and from there are fed into the furnace. If the exhaust fan is delivering the shavings to the separator faster than they can be burned in the furnace, the surplus is

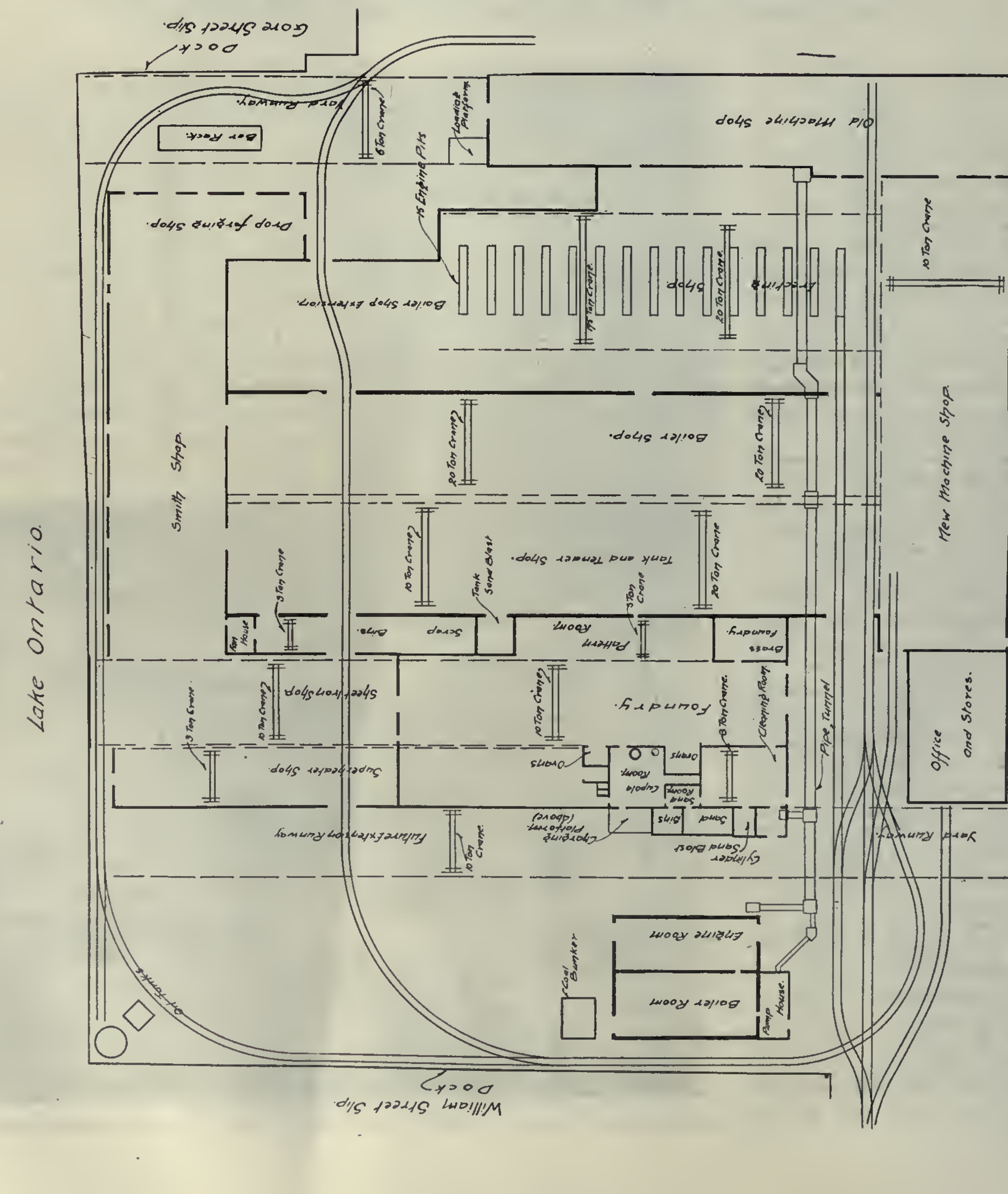
INTERIOR OF PATTERN SHOP.

automatically passed to a storage receiver inside the boiler room. From here the shavings fall to the floor and are fed to the furnace by hand as required.

Sanitary bubbling drinking fountains are stationed at various points in the shops and modern toilet requisites are provided above the dry kilns, thus economizing floor space. There are two dry kilns, one for each department. They are heated on the same system as that employed for warming the shop; but not by the same heating installation. A small Sturtevant unit for this purpose is located on top of the kilns behind the lavatories. The whole shop is fitted with a sprinkler system, the inside of the kilns being also similarly equipped.

In the carpenter department, the more important machines are motor-driven, the remainder being arranged in groups driven from shafting. The main line shaft and jack shafts run in Chapman double ball bearings. The following makers supplied the bulk of the machines in the carpenter department: Greenlees, Brothers Co., Berlin Machine Works, Ltd., Canada Machinery Corporation, Ltd., and Oliver Machinery Co.

In the pattern shop, every machine has an individual motor drive, and the glue pots are heated by electricity. The bulk of the equipment was supplied by the Oliver Machinery Co., Grand Rapids, Mich., and includes two saw benches with universal saw guards, combination saw (rip and cross cut), 26-inch single surface planer, three patternmaker's lathes with variable speed motor-driven heads, universal pattern lathe taking work 8 ft. diameter by 8 ft. long, Besly motor-driven disc grinder, etc. A small



GENERAL PLAN OF SHOPS, CANADIAN LOCOMOTIVE CO., KINGSTON, ONT.

bench trimmer is provided for every two men, and the shop is splendidly fitted out in every way. In fact, it is probably one of the finest pattern shops in Ontario, if not in the Dominion.

Adjoining it is a six-storey pattern storage building, equipped with sprinkler system and hose stands on each floor. An Otis-Fensom elevator serves the building, which covers an area of 74 ft. by 61 ft. The heavy patterns are stored on the ground floor while the remaining floors have the usual racks and shelves. The aisles are illuminated by Tungsten drop lights, lamps on extension cables also being available.

The Foundry.

Though the new foundry is not adjacent to the pattern shop, its description follows logically upon that of the latter. It went into operation at the beginning of June, 1913, being the second of the new buildings to be completed. It is a steel frame building with brick curtain walls, and is approximately 242 feet long, with a maximum width of 158 feet. It consists of the usual three bays together with a crane runway on the east side, which is roofed in for use as a storage bay. The crane is a 10-ton Whiting, equipped with an Electric Controller and Mfg. Co. magnet. The runway extends 125 ft. past the end of the foundry to the north and crosses the yard trackage system. Pig iron and scrap can thus be rapidly unloaded from the cars by the magnet and conveyed to the other end of the bay, which is there entirely closed in. The runway will eventually be extended to the south boundary of the lake.

Industrial tracks run along the inner side of this storage bay from the lower end of the charging platform. Coke is shovelled onto the trucks, and the scrap iron and pig are loaded up by the magnet. The trucks are then run forward to a small platform scale and after weighing are raised by the travelling crane to the charging platform, which is of steel plate. The wheel base of the trucks is very short and the wheel flanges, instead of being rounded, are square. This enables the trucks to be readily run across the steel platform without the use of rails, the short wheel base causing them to "steer" easily.

There are two Whiting cupolas, sizes No. $3\frac{1}{2}$ and No. 7. Blast for the latter is supplied by a No. $5\frac{1}{2}$ Roots blower driven by a Canadian Westinghouse variable speed motor of 30 H.P. The smaller cupola is served by a Sturtevant No. 7 high pressure blower, belt driven by a Canadian Westinghouse 15 H.P. motor. These blowers are located on the mezzanine floor seen below the charging platform in the cross section of the foundry. The speed of the Roots blower can be varied by a master controller affixed to the front of the cupola within easy reach of the tapping platform, thus enabling the blast pressure to be varied at will. There is also telephonic communication between tapping platform and charging floor. On the ground floor of the cupola room there is a Whiting cinder mill driven by a 6 h.p. Canadian Westinghouse motor.

To the south of the cupola room is the core department, which is equipped with two ovens, 14 ft. by 11 ft., and 9 ft. by 14 ft. respectively. Both are fitted with tracks for core trucks and are served by a 5-ton Whiting electric jib crane, which also covers the cylinder pits in the main bay. Small cores are dried in two Whiting 3 ft. by 6 ft. drawer ovens. The firing pit is located behind the ovens and inside the cupola room, coke being the fuel used. For dry sand moulds there are two ovens on the opposite side of the cupola room. These measure 17 ft. by 10 ft., and are served by a 5-ton jib crane.

The remaining portion of this east bay is occupied by a cleaning department for the smaller castings. This room is served by a 3-ton floor operated Whiting electric travelling crane and is equipped with two Whiting tumbler mills, fitted with dust collectors, exhauster and piping. The mills are driven from a line shaft, and may be

MAIN BAY OF FOUNDRY LOOKING SOUTH.

run together or separately. A Canadian Westinghouse 20 h.p. motor drives this shaft and also the exhauster fan, which is a No. 5 Sturtevant. Further equipment in this room includes a core wire straightener and a motor-driven double emery grinder.

They are brought in on the industrial tracks shown in the plan, and after the fins have been chipped off are taken into the sand blasting room. This contains a No. 8 Pangborn high pressure sand blast machine. The flying sand is collected by an exhaust head and Sturtevant fan driven by a 3 h.p. Crocker-Wheeler motor. The sand is afterwards passed through a Pangborn separator and used over again. Adjacent to the sand blast room are the sand storage bins. These are of brick construction and have the toilet rooms arranged on top of them. The bins are of course filled by the runway crane.

The main bay of the foundry is 53 feet wide and is spanned by a 10-ton Whiting crane and it is intended to add a second crane of 15-tons capacity at a later date.

INTERIOR OF BOILER SHOP.

Behind the main cleaning room is a chipping room and sand blast room. Here the larger castings are cleaned.

INTERIOR OF TANK SHOP.

The crane runway has been extended 183 feet beyond the south end of the foundry to the water front. This runway is at present being used for storage of flasks, and during the past summer many of the larger castings were cleaned there, but it will eventually be closed in to form a sheet iron shop and cabs, jacket work, etc. will be done here. This shop will be served by a 10-ton Whiting crane. Running parallel with it, and forming an extension of the east bay of the foundry, there will be a superheater shop 168 feet long, also served by a travelling crane. Here the superheaters, which have now become almost an essential feature of the modern locomotive, will be assembled and tested previous to passing to the erecting shop.

Returning now to the foundry, the west bay next calls for notice. This bay is some 60 ft. shorter than the main bay, a chamber having been built out into it from the tank shop for sand blasting tender tanks. Another 20 feet are occupied by racks for storage of patterns that are about to be used on the floor. Most of the space in this west bay will eventually be occupied by molding machines, the equipment not having yet been finally decided upon. The only machine so far installed is a Davenport jar ram, roll-over and pattern drawing machine of 750 lbs. capacity. A 3-ton floor operated Whiting electric travelling crane serves this bay, and there is an exactly similar crane in the east bay.

At the north end of the west bay a space 40 feet long by the full width of the bay has been partitioned off to form a brass foundry. The floor is of concrete and the equipment consists of two pit furnaces, and an oil-fired tilting furnace, portable core oven, band saw, wet tumbler and a 1-ton jib crane.

The foundry is heated on a hot blast system, exhaust steam from the power house being utilized in the usual coils, through which cold air is drawn by a Sturtevant motor driven fan. The warmed air is delivered into large overhead sheet iron ducts extending down each side of the foundry. At intervals there are down drops terminating in two, or in some cases three legs delivering warm air at about 8 feet above floor level. From here it rises into the monitor over the main bay and escapes through the opening sash frames carrying away the gases and dust with it. The layout of the ducts has been very carefully arranged to give a comfortable temperature in every part of the foundry. The sand bins are also heated to eliminate the risk of their freezing up in winter. Artificial lighting is by Cooper-Hewitt quartz arc lights in the main bay, incandescent drop lights of 50 c.p. being used elsewhere.

A continuation of the west bay beyond the tank sand blast room forms a crane-served runway where the scrap bins are located. By means of a magnet the scrap is readily loaded into cars which are brought in on the track running across the site a short distance south of the foundry. Scrap is conveyed to the bins from the boiler and tank shop on trucks running on this same track.

Tank and Tender Shop.

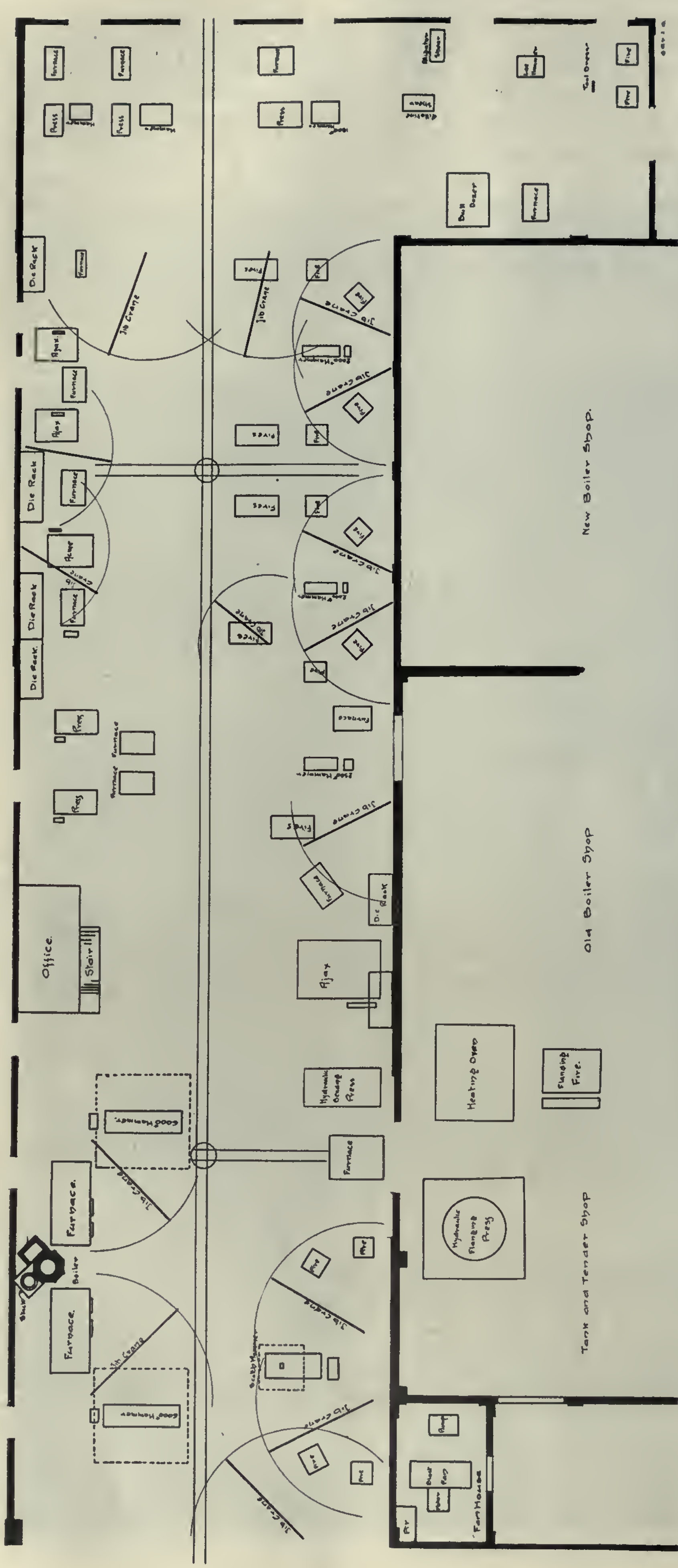
This building stands on a previously unoccupied site and was consequently the first of the new shops to be built. In making this statement, the boiler shop is excepted. The latter is really a new building, being not much more than two years old; but it was completed before the present scheme of rebuilding the entire plant was undertaken, and must hence rank as one of the "Old" shops. It is thoroughly up-to-date in every way, however, and there is no intention of re-modelling it, though an addition will be made to it, as explained later.

The new tank and tender shop is 397 feet long by 67 feet wide. The engine and tender trucks, tender tanks and tender frames are fabricated here; also cab and ashpan work, pending construction of the new sheet iron shop. Truck work is done at the north end of the shop, angle and plate work at the south end, and tender tank and frame building in the centre.

The shop is served by a 20-ton double trolley 5-motor Cleveland crane and also by a 10-ton Whiting crane, this service being supplemented where necessary by Whiting jib cranes fitted with electric hoists. Flanging is done on a 600-ton four column hydraulic press having 12 ft. clearance. This was built by R. D. Wood & Co., Philadelphia, and is served by a 12 ft. by 8 ft. oil fired Ferguson furnace. This press is, of course, principally employed on boiler work, but is located in the tank shop for convenience at present.

LOCOMOTIVE BOILER SUSPENDED OVER HYDRAULIC RIVETER.

Most of the machines in this department have individual motor drives, though a few along the west side are belt driven from shafting. The equipment is of a standard character and includes, in addition to the usual shears and punches, an automatic spacing punch, Hilles and Jones horizontal



LAYOUT OF MACHINERY AND EQUIPMENT IN NEW BLACKSMITH SHOP.

punch, and angle iron shears. There is also a very fine 48-in. x 48-in. x 14 ft. Cincinnati planer fitted with a Lancashire reversing motor drive. The tools for truck work are located towards the north end of the shop and include double travelling head slotter, double travelling head shaper, 60-inch American radial drill, Bertram 42-inch car wheel boring machine, 42-inch Bullard boring mill, Bertram double axle lathe, Newton double spindle drill, etc. Truck wheels are forced on their axles by a 250-ton hydraulic wheel press, served by a jib crane with electric hoist.

Natural lighting in the tank shop is by nine transverse monitors fitted with continuous swinging sash. Cooper-Hewitt quartz arc lamps furnish artificial light. The shop has a floor of creosoted wood blocks laid on edge. Heating is by the hot blast system as in the foundry, pattern shop, etc.

The Boiler Shop.

As previously stated this shop is about two years old and does not enter into the present scheme of reconstruction. It will, however, be extended by the addition of an L at the south-west corner when the new erecting shop is completed. The shop is parallel to and of the same length as the tank shop. It has a width of 60 feet, and the L addition will cover an area of 123 ft. by 76 ft. The main shop is a steel framed structure with concrete walls. Side windows and large skylight areas give good natural lighting, artificial illumination being by Cooper-Hewitt quartz arc lamps. The whole area of the shop is served by two Shaw 20-ton cranes, one of them being equipped with an auxiliary 5-ton hoist.

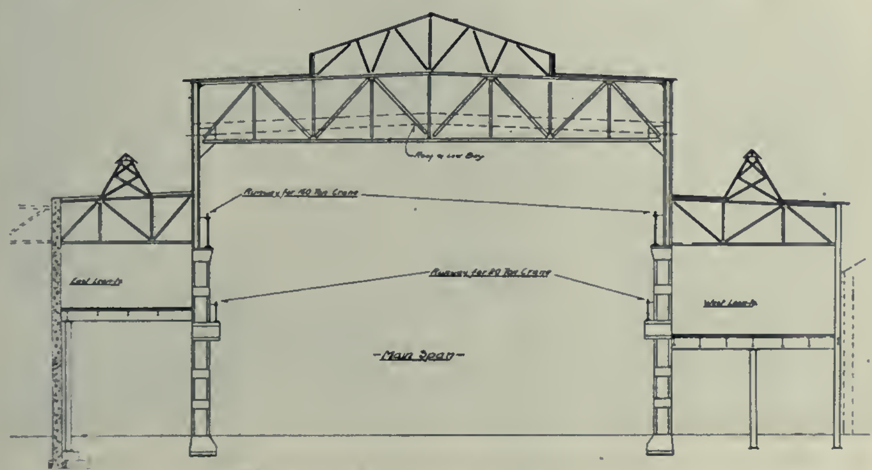
Boiler riveting is done at the south end of the shop, where there is a hydraulic gap riveter, accumulator and Snow pressure pump. The riveter and accumulator were supplied by the Chambersburg Engineering Company. The riveter has a depth of gap of 14 ft. 6 inches and is of the multiple pressure type. Pressures of 25, 50, 75, 100 or 125 tons can be exerted according to the size of rivet being closed, the water pressure used being 1,500 lbs. per square inch. The riveter is served by a hydraulic crane, which was also made by the Chambersburg Engineering Company.

A large proportion of the machine tools in the boiler shop have individual motor drives. Included in these are Hilles and Jones heavy plate bending rolls, Cleveland punches and shears, Bertram punches, Newton cold saw, Ryerson high-speed friction saw, etc., etc. There are two plate edge planers with capacities up to 15 feet and 20 feet respectively. The latter is a very fine tool by Dempster, Moore and Co., Ltd., Glasgow, Scotland, and is fitted with pneumatic clamps for holding down the work. Further equipment includes a Bertram motor-driven horizontal punch, Newton 3-spindle mud ring drill, a Lassister 6-spindle staybolt machine, and two Bertram radial drills. This shop differs from most of the others in being heated by direct radiation.

Blacksmith Shop.

The new blacksmith shop is not yet built. It will occupy a position south of the boiler and tank shops and will be in the form of an L. The shop will have a length of about 274 feet and a width above the L of 67 feet. The foot of the L will measure 115 ft. by 40 ft., and will be used chiefly as a drop hammer shop and tool dressing department. At present drop forging work is being done in a small frame building near the old blacksmith shop. The present equipment for this work consists of one 1,400-lb. steam hammer by the Erie Foundry Co., one 600-lb. drop hammer by Billings and Spencer, one blanking and one trimming press by E. W. Bliss and Co., and two Ferguson oil furnaces. When the new shop is completed this equipment will be considerably increased.

Much of the equipment in the main leg of the new blacksmith shop will also be new, while the balance will be transferred from the old shop. The heavy work will be done under two 6,000 lb. double frame hammers, served by 3-ton jib cranes and large double door furnaces. The latter will burn coal, and will be fitted with American underfeed stokers, the waste heat being used to raise steam for the hammers in a vertical boiler. Along the south side of the shop two Bradley hammers and three forging machines, with their attendant oil furnaces, will be arranged. There will be one 1½ inch Acme and two 2 inch Ajax machines, with racks for storage of the dies ranged against the wall close by. For heavier work there will be a 5 inch Ajax machine on the other side of the shop.



CROSS SECTION THROUGH ERECTING SHOP.

The arrangement of the lighter hammers along the north side is of considerable interest. Instead of the fires and hammers being arranged in parallel lines, as is so commonly done, each hammer is located in the centre of a semi-circle of fires. This is not a strictly accurate description of the arrangement, but will serve sufficiently to convey the idea. It makes a very compact layout, and results in practically every fire having jib crane service. The hammers are all of the single frame type, there being two of 2,000 lbs. and one of 2,500 lbs., by the Morgan Engineering Co., and one of 3,400 lbs. by Glen & Ross. The fires will all have hoods leading to an overhead flue, from which the gases will be drawn by an exhaust fan. This shop will be lighted by quartz arc lamps. An annex at the north-east corner of the shop accommodates the blast fan and also the oil pump for distributing fuel oil throughout the various shops. Here also are the heating fan and coils for the blacksmith and hammer, sheet iron and superheater shops.

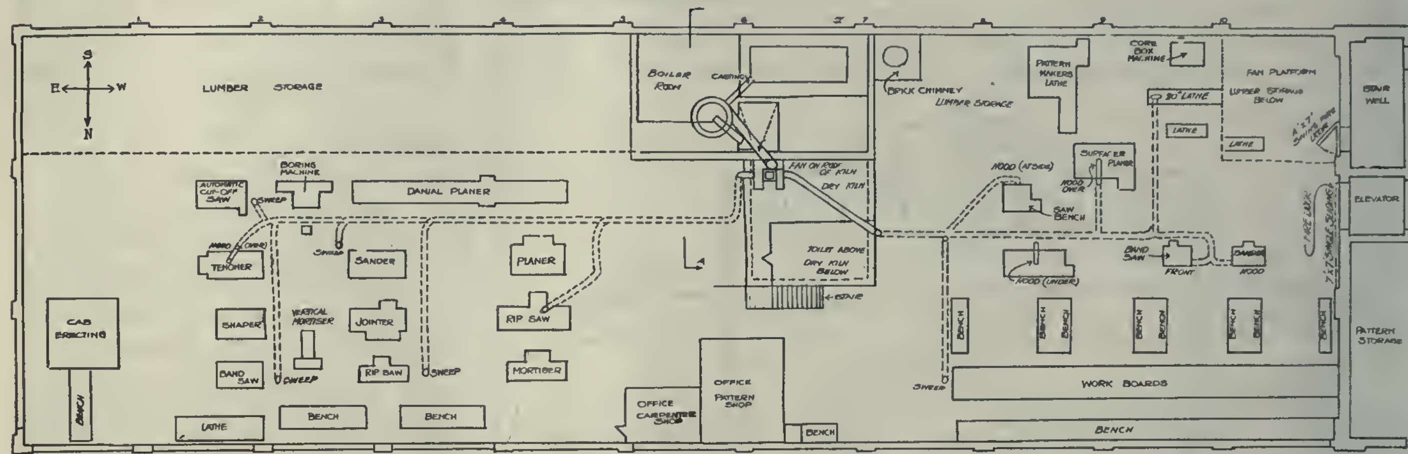
The Erecting Shop.

The new erecting shop is parallel to the boiler shop and has fifteen transverse pits pitched at 17 feet centres. It is of course a steel framed structure and has three bays. The main bay is 275 feet long by 80 feet wide and is served by two cranes. One of these is a 175-ton crane by the Morgan Engineering Co., and is designed for 25 per cent.


VIEW ON GROUND FLOOR OF OLD MACHINE SHOP.

overload. It has a 10-ton auxiliary hoist and is of the double trolley, six motor type. This runs on the upper runway, the rail level of which is 39 feet 6 inches above the floor. Below this there is a second runway on which a 20-ton double trolley Cleveland crane operates. The rails of the locomotive pits are laid on concrete walls and are held down by steel clips. Each pit has three electric light sockets and three connections for compressed air.

Both side bays have a gallery overhead in which will be located pipe shops, electrical department, tinsmith shop, paint room, lavatories, etc. The east bay extends the full length of the shop, but the west bay stops short at the column between the tenth and eleventh pits. Access to and from the old machine shop is had by a standard gauge track to the north of No. 1 pit. Mounted wheels and axles will be rolled in from the machine shop on this track and carried to the necessary pit by the 20-ton messenger crane. When an engine has been wheeled it will be lifted by the 175-ton crane and placed on No. 1 pit which is in direct communication with the yard trackage system.



PLAN OF CARPENTER AND PATTERN SHOPS.

Cooper-Hewitt quartz arc lamps will be used in this shop, supplemented by incandescent drop lights where necessary.

Machine Shops.

As may be seen from a study of the plan of the works, there are two machine shops, arranged in the form of an L. The new machine shop at present forms the erecting shop, some of the heavy machine tools also being located here. However, on completion of the new erecting shop, this building will be pulled down and rebuilt as a steel-framed structure of thoroughly modern design. It will be served by two 10-ton travelling cranes and will provide accommodation for most of the heavier machinery, such as frame-planers, frame-slotters, etc. These tools already occupy part of this site, but are very much crowded together and have only jib crane service. Wheel and cylinder work will also be done in this shop. Among the more important tools now to be seen in the present shop may be mentioned a Newton 4-spindle frame drill, Bertram triple head frame slotter, and heavy planers with Lancashire revers-


DRILLING AND FITTING LOCOMOTIVE FRAMES. THESE ARE DRILLED IN BATCHES OF FOUR AT A TIME.

ing motor drive by Bertram and the London Machine Tool Co.

The old machine shop runs parallel with the new erecting shop and is a two-storey stone building, 324 feet long with an average width of 56 feet. With the exception of the frames all the machine work is at present being done in this shop. On the upper floor are located the lighter tools together with the bolt department, tool room, etc.; while downstairs the heavier work is carried out. When the new machine shop is built, many of the tools will be transferred there, particularly those employed on cylinder and wheel work. At present wheels and axles are handled at the north end of the lower floor. The tools for this purpose include a Bertram 84-inch motor driven wheel lathe, Bertram motor driven quartering machine, Bertram 84-inch tire boring mill, Bertram 300-ton hydraulic wheel press, Niles double axle lathe, etc.

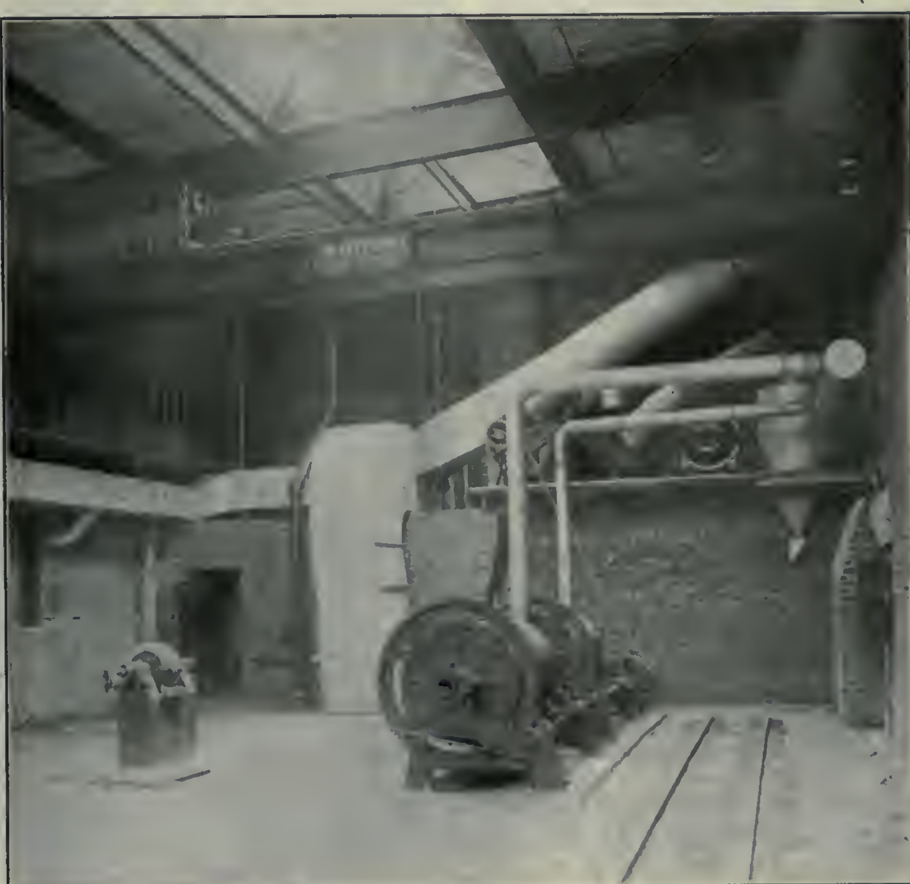
No useful purpose would be served by enumerating all the machines in the shop, but that they are all of the highest class may be gathered from the following partial list of makers:—Bertram, Bullard, Newton, Niles, Canada Machinery Corporation, Wm. Sellers, Inc., American Tool Works, Alfred Herbert, Morton Mfg. Co., Cincinnati Planer Co., Pratt & Whitney, Windsor Machine Co., Potter & Johnston, Jones & Lamson, Landis Tool Co., Cincinnati Milling Machine Co., R. K. LeBlond, Gould & Eberhardt, Brown & Sharpe, Geo. Richards & Co., Clifton & Waddell, W. F. & John Barnes, H. G. Hammett, etc., etc.

There are three Newton heavy vertical millers for main and side-rod work, one of these also being used for milling the corners of mud rings. For milling or fluting rods there are two heavy slab millers, one by Bertram and the other by Newton. Axle box and big-end brasses are machined on a Morton 32-inch draw-cut shaper. The heavy machines are served by electric jib cranes, while work is lifted in and out of the lighter tools by air hoists suspended from runways. The ground floor is lighted by tungsten clusters and heating is by the hot blast system.

SECTION OF FOUNDRY SHOWING CUPOLAS, CORE AND DRYING OVENS.

An elevator and stairway communicate with the upper floor, which is heated in the same way as the lower floor, but is lighted by Cooper-Hewitt mercury vapor lamps. At the south end of this floor is the bolt department fully equipped for turning out the large numbers of bolts, studs and nuts required on a locomotive. The machine tools in this department include an Acme triple head bolt cutter, 4-spindle Lassiter bolt machine, 6-spindle vertical nut tapper, one $3\frac{1}{4}$ inch and one $2\frac{1}{4}$ inch Gridley automatic, $2\frac{1}{2}$ inch Pratt & Whitney turret lathe, one $2\frac{1}{4}$ inch and two 2-inch Jones & Lamson turret lathes, etc. There is also a 5-inch Alfred Herbert turret lathe on which crank pins are rough turned, to be afterwards ground to finished size on a Landis No. 6 Universal grinder located in the tool room.

Close by the bolt shop is the die department where all drop forging and bolt forging dies are made. In some shops, this work is handled by the tool room; but here a separate department has been organized. Several die makers are kept employed on this work, as it is seldom an order for locomotives is received by the company that is so small as not to justify drop-forging a large number of parts. The tool equipment in this department consists of No. 3 Pratt & Whitney die sinker, 25-inch LeBlond



CLEANING ROOM SHOWING THE EXHAUST TUMBLING MILLS AND HEATING SYSTEM PIPES.

lathe, 24-inch Gould & Eberhardt heavy duty shaper, 50-inch W.F. & John Barnes drill press, and a Sterling high speed hack saw machine.

Next comes a group of machines for motion work, such as Hammett link grinder, Bridgeport slide bar grinder, Cincinatti double travelling head shaper, etc. Other machines located near the middle of this floor are a metal cutting band saw by Clifton & Waddell, Johnstone, Scotland; No. 4 Cincinnati plain miller; Richards horizontal boring mill; American 6-ft. motor driven radial drill; Newton heavy duty vertical miller; Bullard 42-inch vertical turret lathe, etc.

The tool room is at the north end of this floor and is divided off by the usual screen. It is used to a certain extent for manufacturing purposes as well as for tool making, the crank pins being ground here, as previously mentioned. Brass finishing is also done in this department. The principal machines here are two No. 3 Cincinnati millers, LeBlond tool room lathe, Landis and B. & S. universal grinders, and Gisholt tool-grinder.

Making Milling Cutters.

The method here employed for making the inserted teeth milling cutters used for slabbing and fluting side rods is of interest. The machinery steel blank has the slots milled with one side (that which coincides with the cutting edge of the tooth) truly radial. The other side however, is inclined at an angle of eight degrees in such a way that the slot is wider at the bottom than at the top. The cutters are milled to suit and are given a slight taper in their length to ensure their being a driving fit. Alternate cutters are driven in from opposite sides of the blank, thus locking themselves by the compression of the soft steel between them. This method of manufacture has been found to be entirely satisfactory and is much cheaper than using set screws or keys to secure the cutters. The cutters are found to remain quite tight even after long service.

Iron Rack, Storage Yard, Etc.

Extending from the south end of the old machine shop to the water front there is a crane runway 234 feet long, served by a 5-ton Northern crane, which is equipped with an Electric Controller & Mfg. Co. magnet. This space forms a storage yard for bar iron, plates, angles. etc. As it lies alongside a slip these materials can be readily brought in by water if desired.

EAST ELEVATION, CARPENTER AND PATTERN SHOPS.

The Power House.

Current for operating these shops is generated in the Company's own power house, erected about eight years ago. It is situated east of the new foundry and is a steel framed building covering an area of 87 ft. by 75 ft., with an annex for the pumps and other auxiliaries. The walls are of reinforced concrete and the flat roof is of hollow tile. A longitudinal fire wall divides the boiler room from the engine room, the former having a width inside of 37 feet 8 inches and the latter 32 feet. Steam at 150 lbs., pressure is raised in six Wicks vertical water tube boilers fitted with Foster superheaters. Four of the boilers are rated at 250 h.p. each, and two at 330 h.p. All are fired by Murphy automatic furnaces in Dutch oven settings. There is a short steel stack 6 feet in diameter through which a draft is induced by a Canadian Buffalo Forge Co. engine driven fan. This installation is in duplicate to avoid breakdowns.

The Dutch oven setting of the furnaces makes the coal handling problem a very simple one. To the south of the power house is an elevated coal bunker, which is filled by a locomotive crane from the yard coal piles or direct from a steamer at the adjacent wharf. An elevated industrial track runs from below this bunker into the boiler house and across the top of the Dutch ovens. Small tip wagons are thus quickly filled up at a chute in the bottom of the coal bunker, run into the boiler house and dumped direct into the furnace hoppers. On their way they pass over a small track scale and are weighed. At present ashes are raked out of the pits by hand and taken away in wheel-barrows; but it is the company's intention to shortly instal an ash disposal system on the suction principle.

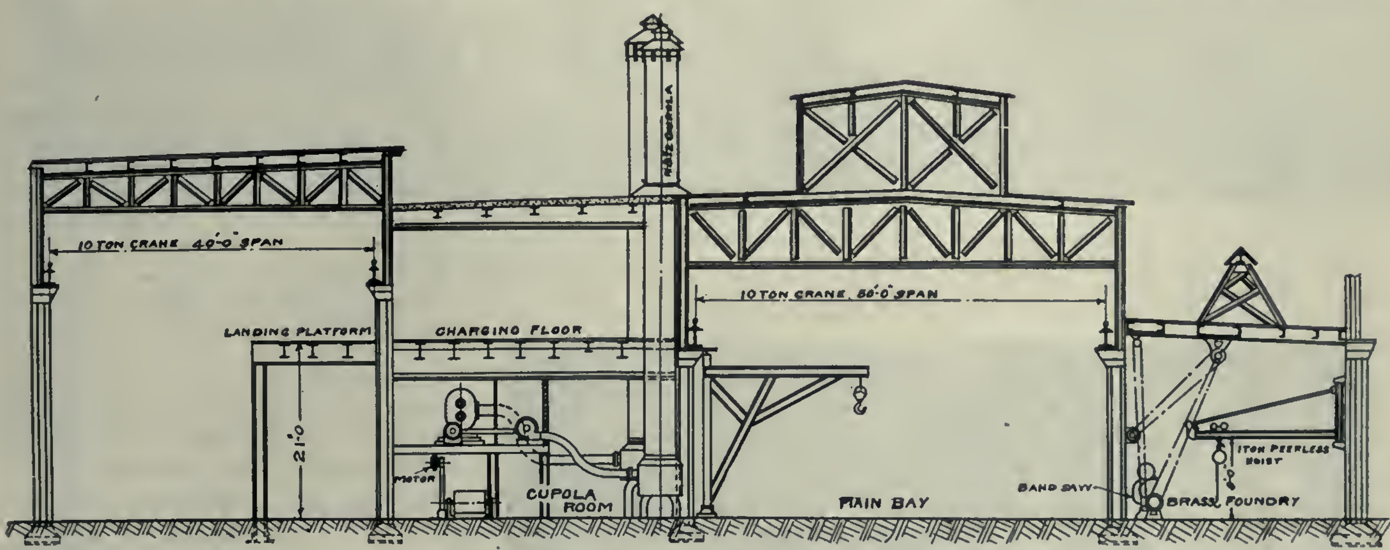
The engine room has a dado eight feet high of white tiles, which gives it a very pleasing appearance. It is equipped with a hand operated 5-ton traveller and is lighted by arc and tungsten lamps. There

INTERIOR OF BRASS FOUNDRY.

are three generator units with a total nominal capacity of 750 kilowatts. The engines are all by Belliss & Morcom, and the generators by the Canadian Westinghouse Co. These generate direct current at 250 volts.

Compressed air for the whole plant is supplied by two compressor units. One of these is a Belliss & Morcom vertical pumps, which deliver to the heater or to sewer as may be desired.

The engine room contains a handsome marble switchboard of ten panels, and each shop has its own feeder line controlled from a separate panel in the switch-board, the whole of the motors throughout the plant operating at 240 volts. To maintain an even voltage in new erecting shop are ready for use the old office building and erecting shop will be demolished and the new machine shop built on their site. The new office building will accommodate the accounting, time-keeping and mechanical engineers' departments, etc., and will include a drafting office of considerable size. When all the alterations are completed,



CROSS SECTION THROUGH FOUNDRY BUILDINGS.

cross-compound two-stage compressor with a capacity of 2,000 cubic feet of free air per minute at 100 lbs. pressure when running at 250 r.p.m. The second unit is a Canadian Ingersoll-Rand horizontal cross compound Corliss two-stage compressor 1,250 cubic feet capacity per minute at 100 lbs. pressure, running 96 r.p.m. The exhaust from all five units can be discharged to the atmosphere, to the shop heating system, or to a Worthington barometric condenser. A vacuum of about 27 inches is maintained in the latter by a 6-12-10 Knowles vacuum pump, while the condensing water is raised by a No. 8 single stage turbine pump built by the John McDougall Caledonian Iron Works Co., Ltd., Montreal. This is direct driven by a Robb-Armstrong single cylinder vertical engine.

The boiler feed is delivered by two Blake and Buffalo steam pumps, 10-5-10. The water is drawn from Lake Ontario and after passing through a Webster open heater is measured by an automatic recording Venturi meter and is thus checked against the coal, which as previously stated is all weighed. The boiler feed lines are in duplicate, and, as a precaution against the failure of both feed pumps, two No. 9 Korting injectors are always available.

For general water service there is a 10-7-2 steam pump by the Canada Foundry Co.; and the same firm built the two fire pumps, the larger of which is a 20-12-6 and the other a 16-9-12. For handling the returns from the heating system there are two Burnham 10-16-16 vacuum

the lighting circuits there is a motor generator balancing set of 10 kilowatt generator capacity.

From the power house a pipe tunnel runs across the site as far as the old machine shop. This accomodates the high and low pressure steam pipes, water service pipes, etc.

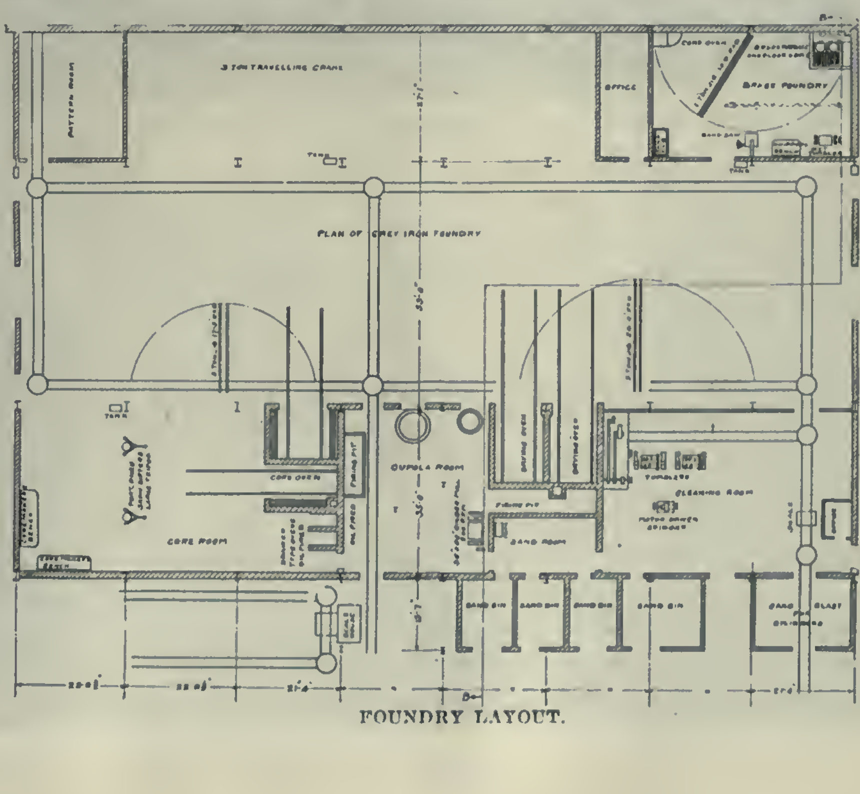
Office and Stores Building.

A handsome new stores and office building of four storeys is now nearing completion; and as soon as it and the

the Canadian Locomotive Co. will have a compact and, considering the limitations of the site, a very conveniently arranged plant. Except for the pattern and carpenter shop, every building will be in direct communication with all the others, the work converging from all sides upon the erecting shop, where it is finally assembled.

Organization, Etc.

The following is a brief outline of the methods that have been adopted to in-



FOUNDRY LAYOUT.

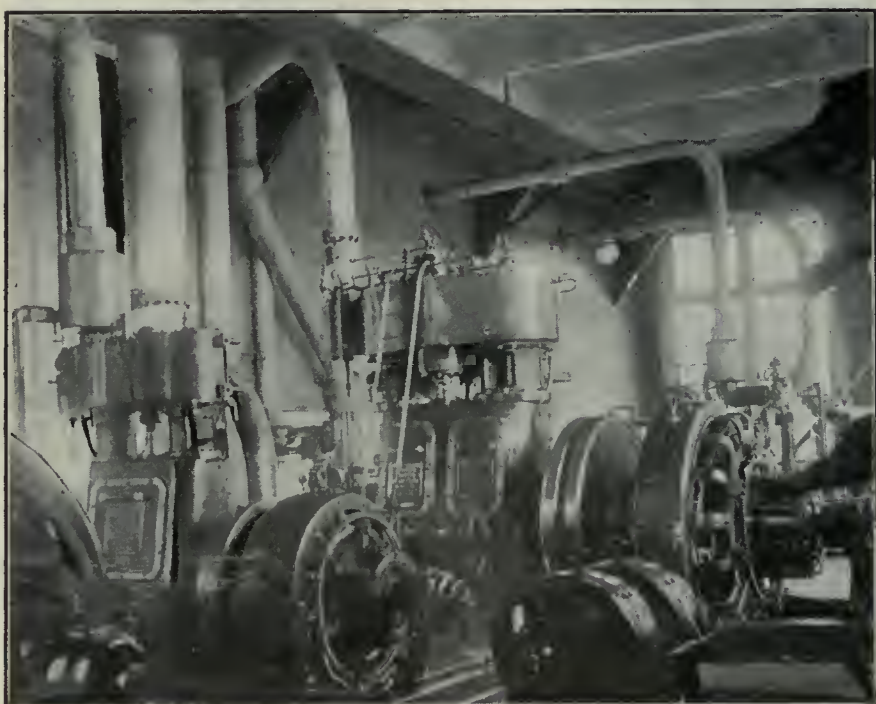
crease output since the reorganization of the new company. This is in addition to the rebuilding of the plant.

Department heads have been selected and the work specialized, so that each one will handle the work for which he is best adapted and with which he is most familiar. Each department head is held directly responsible for the results obtained in his shop, and department heads co-operate with each other for the best interest of the work as a whole. Written suggestions for improvements of any nature are sent into the management and, if approved, are put into effect at once. If not, they are held for future consideration.

Old and badly worn machines have been replaced by new tools of the latest type. The machinery has also been largely rearranged and strengthened to operate more efficiently. Jigs, special tools and equipment have been purchased or manufactured; and methods have been changed with a view to producing the work in the most up-to-date manner.

Date schedules have been made and placed in the hands of all concerned, showing when it is necessary that work be finished in each department in order to maintain the output. A system of "Delay Reports" has been established, whereby any department failing to keep up with the schedule requirements is brought to the attention of the management, who give it special attention and assistance as may be necessary. These schedules cover all departments. In order to get engines out on a certain date, it is necessary to start making drawings and patterns, ordering material, etc., some time in advance; and failure in any of these details necessarily means delay in output. On the other hand, the completion of work in each department according to schedule dates means a continuous and steady output, and avoids the otherwise unavoidable "breaks" between orders.

An inter-departmental delay report is in use by means of which any department may ask for work, even though ahead of the schedule, in order to keep men and machines steadily employed. "Move Orders" are used for the delivery and receipt of material between the material stores and shops. This "move order" is also used in some cases for moving material from one shop to another, receipt for delivery being taken thereon. These "move orders" are anticipated as far as possible in order to avoid congestion in the Material Department.



INTERIOR OF POWER HOUSE, SHOWING ENGINES AND GENERATORS.

Piece work has been established in nearly all departments. Prices are based on actual conditions under which the work is performed, these having been ascertained from time studies and other records. It has been the company's policy to secure the best men and pay them the highest wages. Good tools and conditions are maintained, and much attention has been given to dealing fairly and honestly with the employes and to avoiding the usual "red tape" which tends to cause so much discord and dissatisfaction.

A system of timekeeping and accounting has been installed, whereby accurate records of costs are obtained. These records are furnished to department heads, all of whom co-operate to eliminate waste and unnecessary expenditure. Allowances are allotted to each department and an effort is made by each department head to keep within the allowance as far as is consistent with the best interests of the work. Necessary records are given to each foreman to enable them to handle their work to the best advantage.

Throughout the plant the conditions under which the men work have been greatly improved. Sanitary drinking fountains and steel lockers for clothing and tools have been placed in each shop. Good wash rooms and toilets are being placed in all the new buildings and are kept clean and sanitary at all times. Machine gears and other dangerous places are carefully guarded, and first aid treatment is promptly given to any injuries that may occur. In fact the company has made the conditions under which the men work as pleasant as possible in an earnest effort to have its employes satisfied and contented.

THE ROELOFSON ELEVATOR CO.

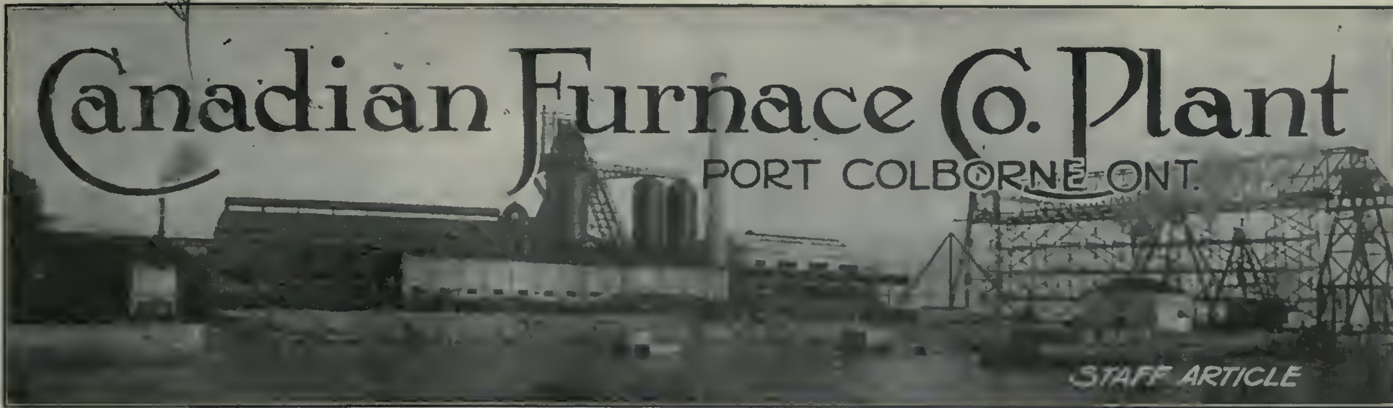
ONE of the more recent concerns established at Galt, Ont., is the Roelofson Elevator Co., who started operations there in February, 1911. This firm manufactures a complete line of passenger and freight electric elevators, worm gears, controllers, etc. The site covers 3½ acres and is connected with the Galt, Preston and Hespeler Railway.

The main building is 204x66 ft. 8 ins., of brick construction, with concrete floors. At one end are the offices and a general store room and at the east end a carpenters' shop and blacksmiths' shop. The building is equipped with the latest machinery for this class of work and the most modern methods are used in the construction of the product. J. Frank Roelofson is the manager of the company.

GUELPH STOVE CO., LTD.

AN old established Guelph, Ont., concern, the Guelph Stove Co., Ltd., have built a new plant in the eastern section of that city. The site covers about 4½ acres and the buildings cover an area of 57,619 sq. ft. The buildings are of brick construction and were designed by W. A. Mahoney, architect, Guelph. They cost $40,000 and comprise a foundry, pattern shop, boiler, milling, nickeling, assembling and packing rooms, warehouse and office.

The product of the company is stoves, and manufacturing was commenced early in 1912. The company is financed entirely by local capital.



Canadian Furnace Co. Plant

PORT COLBORNE ONT.

STAFF ARTICLE

From the standpoint of industrial enterprise with its necessary accompaniment of confidence in the future greatness of this Dominion as a commercial nation, the completion and subsequent successful operation of the Canadian Furnace Co. plant at Port Colborne ranks as one of the most important manufacturing developments of the year 1913.

THE Canadian Furnace Co. recently started operations at their new plant, Port Colborne, Ont., for the manufacture of pig iron. The furnace was successfully blown-in on September 27, and on the following day a heat was drawn. The site of the plant is called Victoria. It is situated at the junction of the Welland Canal and Lake Erie, with a frontage of 2,200 ft. to the canal, 660 ft. of which is already docked; the remainder to be converted into dockage as fast as improvements can be carried out. Where the furnace now stands was originally under water to a depth of 5 ft. The bottom, however, is rock, upon which the foundations were laid by means of cofferdams.

The company have at present 12 acres under development but they have altogether a property covering 50 acres, a large portion of which is still under water, leased from the Government for a period of 63 years. At the dock there is a depth of 25 ft. of water, but the layout provides for a depth of 30 ft. at a future date. The largest lake boats are able to discharge their cargoes of raw material at the dock. These latter consist of ore from Lake Superior points and from the Belmont mine at Cordova Mines, Ont., owned by the company. Limestone is shipped from Calcite, Mich., and coke from the Connellsville region in Pennsylvania. The location of the furnace is exceptionally good, being as already stated on the canal and therefore on the highway between the Great Lakes and eastern points; thereby affording a good centre for the distribution of the product as well as being favorably situated for obtaining raw materials.

All the stock of the company is owned by the Buffalo Union Furnace Co., Buffalo, N.Y., and the furnace is being operated by them to supply the Canadian market. The plant was designed by the company's engineer, and the contracts

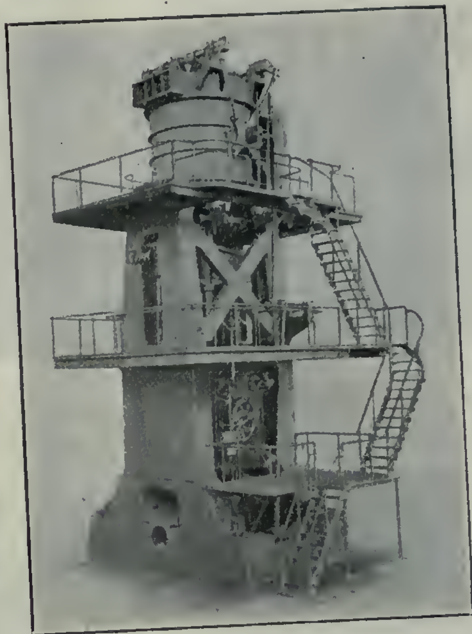
GENERAL VIEW OF PLANT FROM YARD ENTRANCE.

for construction and supply of equipment were let individually. The foundations were built by the Monarch Engineering Co., Buffalo; the bricklaying contract was carried out by the A. E. Anderson Co. Buffalo; the firebrick for the furnace, stoves etc., was supplied by the Harbison-Walker Refractories Co., Pittsburgh, the Stowe, Fuller Co., Cleveland, and the General Refractories Co. The steel work for the buildings was supplied and erected by the Canada Foundry Co., Toronto.

It will be observed from the general plan, and from the description to follow, that the handling of materials has been reduced to a minimum with a consequent reduction in operating expenses which is in itself an important feature. The industrial track system is standard gauge, and is connected with the Grand Trunk Railway. The company operates the system with their own locomotives. Under normal conditions about 150 men are employed in the operation of the present furnace, which has a capacity of 325 tons per day. Provision has been made, however, for the building of another furnace on the lake side of the present furnace.

Ore Dock and Bridge.

The ore dock has at present a frontage of 600 ft. on the canal and has a width, for storage purposes, of 235 ft. It will be possible to store about 250,000 tons of ore and 100,000 tons of limestone for



SINGLE UNIT, VERTICAL LONG CROSS-HEAD BLOWING ENGINE.

use during the period when navigation is closed. Tracks are laid the full length of the ore dock or storage yard, and on each side for the ore bridge which carries the raw materials from the ships at the dock to the storage bin system or to the yard according to requirements.

The ore bridge is a substantial steel structure and was supplied and erected by the McMyler Interstate Co., Cleveland, O. It has a main span the full width of the storage yard viz. 35 ft., and in addition, has at the canal end a swinging apron 50 feet long, and at the shore end over the bin system tracks, a cantilever span of 40 feet. The bridge is 80 feet high from the dock level to its underside. It is electrically operated, and is equipped with a 3 cub. yd. bucket. Another ore bridge of the same size and capacity is now being constructed.

When in operation, the ore or stone, as the case may be, is carried from the ship at the dock along the ore bridge and dumped into the transfer car which runs on tracks laid over the storage bin system, the car being stationed under the cantilever arm to receive the contents of the bucket. The transfer car has a capacity of 30 tons, is electrically operated and was supplied by the Brown Hoisting Machinery Co., Cleveland, Ohio. When full, the car travels along and deposits the ore into the bins underneath according to the grade of ore being handled. The incline trestle approach from the railway tracks to the top of the bin system is 850 feet long and 30 feet

SHOWING INTERIOR OF CAST HOUSE.

high at the bins, and was built by the Lackawanna Steel Co.

The coke is received in cars over the trestle and is dumped directly from each car into the coke bins, which are those adjacent to the skip bridge. As indicated in the general plan, coke is drawn directly from the bins to the skip cars.

The ore was brought to the bins in cars before the bridge was completed.

Storage Bin System.

The bin system is parallel to the storage yard and was installed by the Canada Foundry Co. There are 6 ore bins with a total capacity of 1,800 tons, 2 limestone bins with a total capacity of 500 tons, and 2 bins capable of storing 600 tons of coke. The bins are bricked in, and a steam heating system is installed to prevent freezing in severe weather. Under the bin system is the stock house which is equipped with tracks for operating the scale car. The latter has a capacity of 10 tons, is electrically operated and was supplied by the Brown Hoisting Co. The car transfers the materials from the bins to the skips at the bottom of the skip hoist. An interesting feature about this car is that it is equipped with a series of scales which are set to register the amount taken from each bin, and in the desired proportions according to the quality of pig iron that is ultimately required. The underside of each bin has a hopper door which is under the control of the operator of the scale car.

STOVES AND FURNACE TOP FROM BINS.

Skip Hoist.

The steel skip bridge which is shown on the cross section is double track, there being two skip cars, one ascending as the other descends. From the skip car, material is dumped into the receiving hopper on top of the furnace.

SHOWING LOWER PART OF FURNACE IN CAST HOUSE.

The skip hoist is of the McKee type and the two skip cars transfer the materials from the scale car to the top of the furnace. The Variety Iron & Steel Co., Cleveland, Ohio, supplied and erected this equipment.

The skip cars are operated by an Otis reversible steam hoisting engine located in an engine house under the hoist. The engine has two 14 in. diameter cylinders by 14 in. stroke, the winding drum being 6 ft. diameter and 8 ft. long. The charge for the furnace consists of 2 skips of ore, one of stone and two of coke, which is equivalent to 13,600 lbs. of ore, 3,400 lbs. of stone and 6,500 lbs. of coke, the proportion varying according to the quality of pig iron required.

The skip car is mounted on a frame with three sets of wheels, the frame being hinged on the middle axle. The car itself is attached to this frame between the top and central axles and the hoist cable is attached at the bottom axle. The middle pair of wheels have double flanges. All three sets of wheels travel up the incline on the main rails, the middle pair bearing on the inside flanges. As the car approaches the

BOILER BATTERY PREVIOUS TO ERECTION OF BOILER HOUSE.

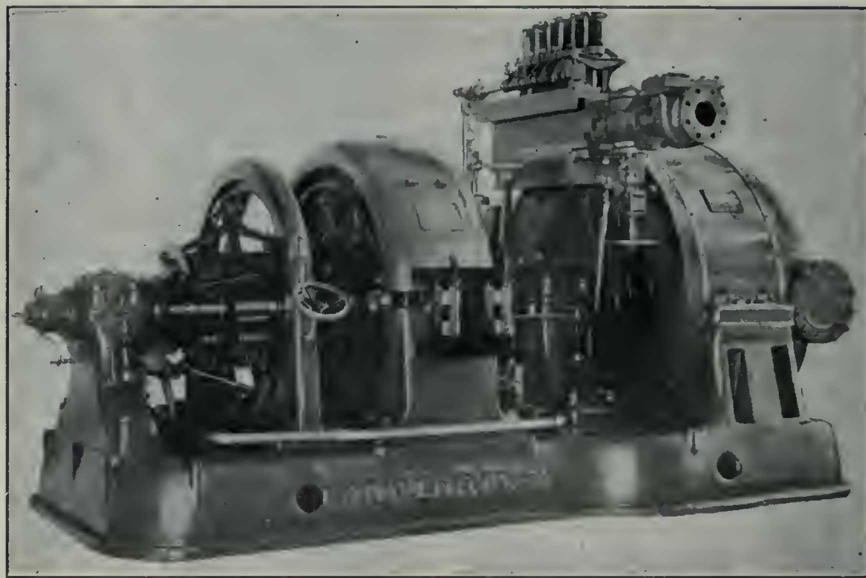
top of the furnace, the main rails are bent over towards the centre of the furnace. The front wheels follow these rails and the centre wheels transfer onto another rail, which catches the outside flanges, and carries them on up the incline, thus dumping the bucket.

Furnace.

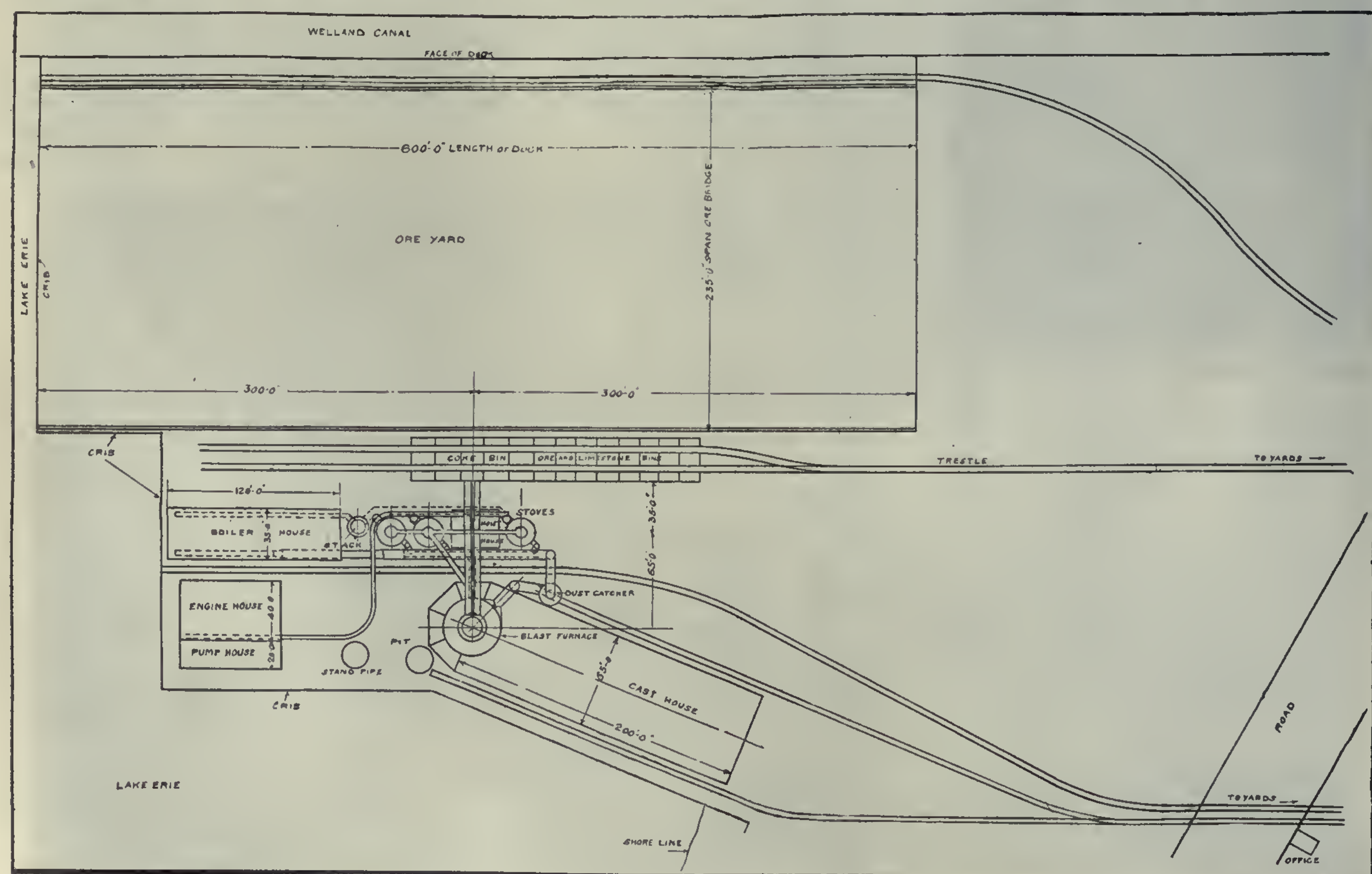
The furnace is located at the lake end of the cast house and was built by the Variety Iron & Steel Co. It is 80 ft. high, 13 ft. 6 in. in diameter at the hearth, 19 ft. 6 in. diameter at the bosh, and 13 ft. 6 in. diameter at the stock line. There are 10 tuyeres through which air is blown at 15 lbs. pressure. The bosh and hearth are fitted with 119 cooling plates made of bronze and supplied by the Tallman Brass & Metal Co., Hamilton, Ont. These plates have a water cooling system, water being supplied through a series of pipes connected to a manifold which encircles the furnace.

The top charging apparatus on furnace top is manufactured under the A. G. McKee patent, the distinguishing feature being the receiving hopper. It is conical in form and rests on ball bearings supported on top of the gas seal.

Through suitable gearing the receiving hopper can be rotated by motor on the furnace structure, as indicated on the drawing. The receiving hopper is closed at the bottom of the small bell. In operation when the skip load of material is dumped into the receiving hopper and while the empty skip car is going back down the incline, an electrical switch which controls the furnace top motor is thrown and the receiving hopper is rotated a predetermined portion of a circle The small bell is then lowered allowing the contents of the receiving hopper to drop on the large bell. The small bell is next closed and the receiving hopper is ready to receive another skip load. After the various materials that form one charge have been deposited on the large bell, the latter is lowered, feeding all the material into the furnace. By this rotation of the receiving hopper to different points the material is distributed uniformly around the large bell, giving a uniform density to the material discharged into the furnace. The bells are operated by electric motors controlled from switches located in a house near the foot of the skip hoist.



300 K.W. CURTIS TURBO-GENERATOR.



GROUND PLAN SHOWING LOCATION OF THE VARIOUS DEPARTMENTS.

The cinder notch is located at the side of the furnace, where the slag is drawn off into a ladle running on tracks outside the cast house. The ladle has a capacity of 15 tons and was supplied by the Wener Machine Works, Lebanon, Pa. The iron notch is in front of the furnace, and is equipped with a McCarthy steam operated mud gun for plugging the hole after the metal has been drawn off. The metal is skimmed while it is being tapped. Near the furnace is an office where are installed two pyrometers supplied by the Uehling Instrument Co., Buffalo. One of these pyrometers indicates the temperatures of the blast and the gas at the top of the furnace, while the other records the temperatures of the gases and blast and also the pressure of the blast.

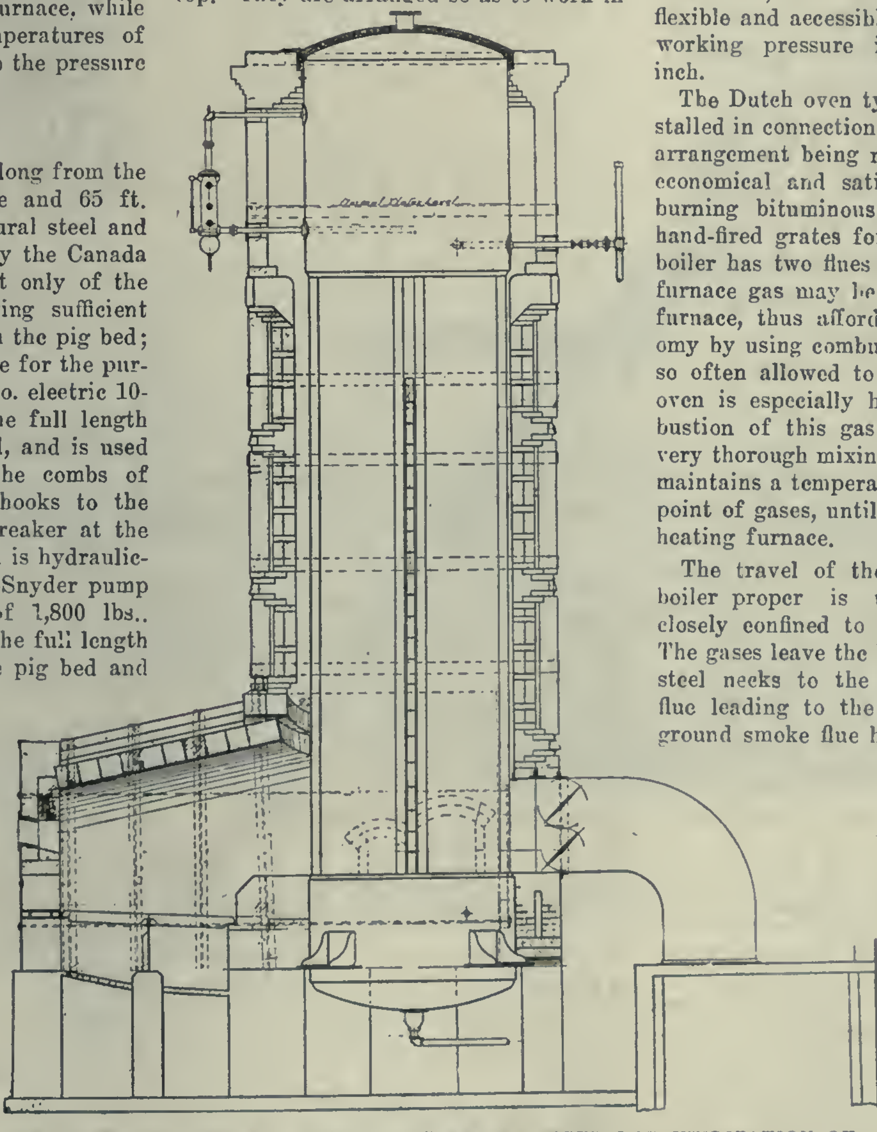
Cast House.

The cast house is 200 ft. long from the centre line of the furnace and 65 ft. wide. It is built of structural steel and was supplied and erected by the Canada Foundry Co. The top part only of the sides is covered in, allowing sufficient space for loading cars from the pig bed; tracks running along outside for the purpose. A Brown Hoisting Co. electric 10-ton crane operates over the full length and breadth of the pig bed, and is used principally for carrying the combs of metal, by means of bed hooks to the Brown Hoisting Co. pig breaker at the end of the cast house which is hydraulically operated by a Wilson-Snyder pump working under pressure of 1,800 lbs.. Overhead runways extend the full length and over both sides of the pig bed and are equipped with McMyler chain blocks for handling the pattern used for making the pig moulds. Outside the cast house is a pit 20 ft. diam. by 20 ft. deep for granulating the slag.

It is the intention of the company to install a pig casting machine which will enable them to supply chill cast basic iron. By this means the iron is tapped from the furnace into a large ladle where it becomes thoroughly mixed. From this ladle it is poured into iron moulds which are carried on an endless belt. The arrangement avoids contact with the sand and secures perfect uniformity of composition.

Stoves.

For heating the furnace blast, three stoves have been installed by the Variety Iron & Steel Co. They are of the upblast vertical type, made of steel plate and lined with fire brick, 250,000 bricks being required for each stove. The stoves are located near the furnace, are 85 ft. high and 20 ft. diameter inside, and have a connecting platform on the top. They are arranged so as to work in series. While two are being heated by the waste furnace gases, the third, having previously been heated, is warming the air which is passing through from the blowing engines to the tuyeres. The furnace gases pass through the 6 ft. diameter downcomer which connects the furnace top with the stoves and is equipped at the top with two bleeders which are set to go off automatically when the pressure rises above a certain point. In the downcomer is installed a gravity type dust catcher which is set above the tracks, allowing the cars to go under and carry away the dust when necessary.



SECTION THROUGH BOILER SETTING AS ARRANGED FOR UTILIZATION OF WASTE HEAT.

Boilers.

The boiler house is 120 ft. long by 35 ft. wide and is of steel and brick construction, the steel work being supplied by the Canada Foundry Co. The boilers are of the vertical water tube type, manufactured and installed by the Wickes Boiler Co., Saginaw, Michigan. The 8 units chosen are of 300 horse-power each, two in a battery; making a total of 2,400 horse-power, thus a very flexible and accessible plant. The boiler working pressure is 150 lbs. per sq. inch.

The Dutch oven type of furnace is installed in connection with the boilers, the arrangement being recognized as a most economical and satisfactory method of burning bituminous coal. Besides the hand-fired grates for burning coal, each boiler has two flues through which blast furnace gas may be introduced into the furnace, thus affording a further economy by using combustible gases that are so often allowed to escape. The Dutch oven is especially helpful for the combustion of this gas as it permits of a very thorough mixing of air and gas, and maintains a temperature close to ignition point of gases, until the latter reach the heating furnace.

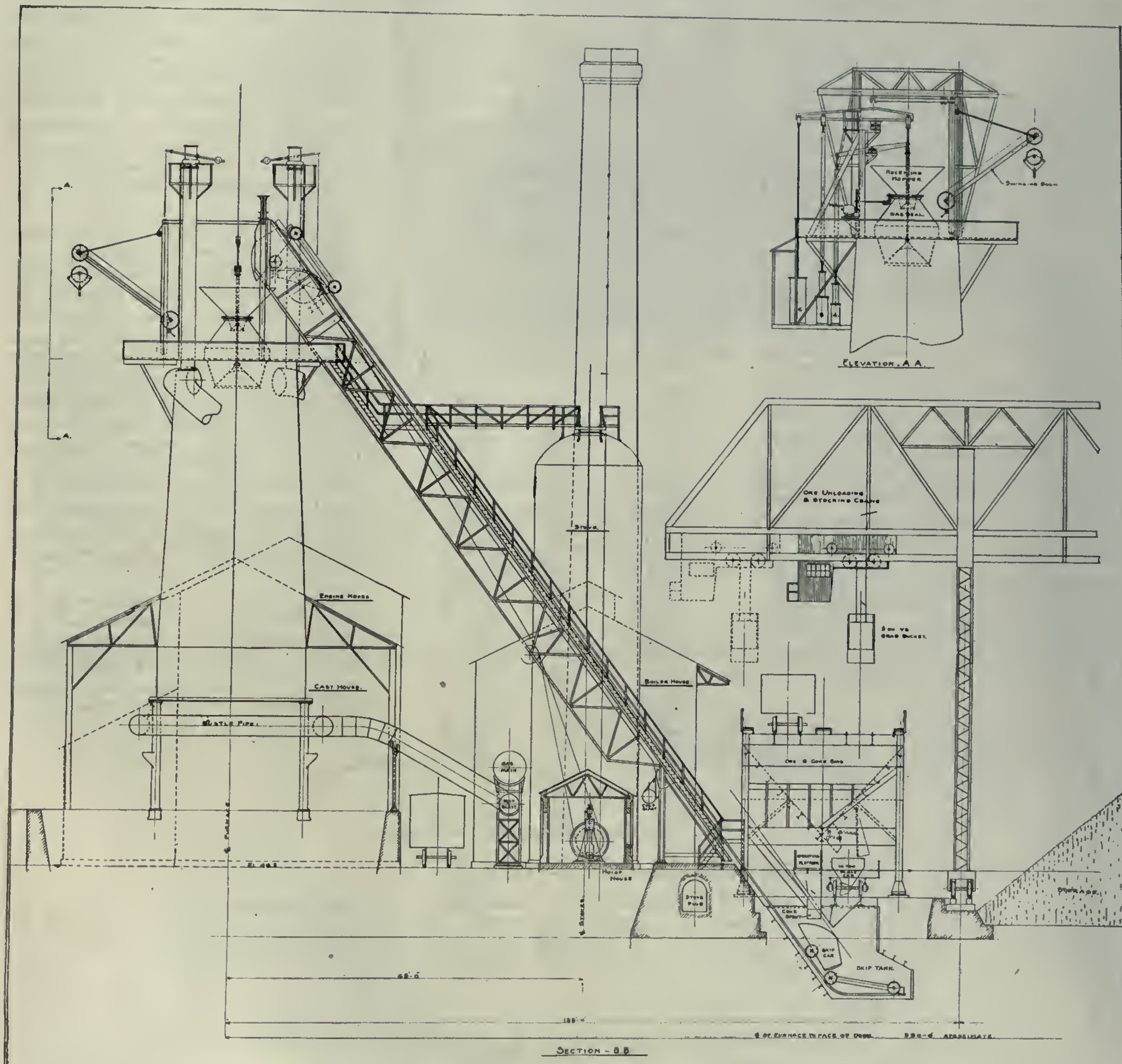
The travel of the gases through the boiler proper is unusually long and closely confined to the heating surface. The gases leave the boilers through short steel necks to the underground smoke flue leading to the stack. The underground smoke flue has the advantage of not interfering with the cleaning of the soot from the heating surface. Soot cleaning doors are located at convenient points in the setting. These doors are reached by the aid of platforms to facilitate blowing the soot off the heating surface. There are two manholes in the upper and lower drums to allow for close inspection of the interior. All the steam piping was furnished by the Best Mfg. Co., Pittsburgh, the main steam line being 14 in. diameter with 6 in. diameter leads to the boilers. Between the boiler house and stoves is a brick stack, 150 ft. high and 10 ft. diameter inside, built by the Heine Chimney Co., Chicago.

Power House.

The power house is of substantial brick construction and is 80 ft. long by 60 ft. wide, inclusive of the pump pit. It contains the blowing engines, the electric power generating sets, pumps, etc. The blowing engines, supplied by the Allis-Chalmers Co., Milwaukee, Wis., are of the compound long crosshead vertica type, with the air cylinders located above the steam cylinders. The H.P. steam cylinder is 48 in. diameter and the L.P. 84 ins. diameter, while the air cylinders are 84 ins. diameter on both sides. The stroke is 66 ins. Corliss valves are fitted to the steam cylinders. The guaranteed capacity of the blowing engines is 380 cu. ft. of air per revolution when running at 55 r.p.m. against a pressure of 30 lbs. per sq. in. The normal speed, however, is about 40 r.p.m., and pressure 15 pounds. The engines are of the same type and make as others installed at the Buffalo plant where they have given very satisfactory service.

An interesting feature regarding these blowers is that they can be operated independently or as a compound unit by a suitable arrangement of the steam and exhaust piping. The H. P. side can be operated as a simple blower taking steam at boiler pressure. Likewise, the L.P. side can be run independently although in this case a reducing valve would have to be used to reduce the boiler pressure to what would be the receiver pressure when the engines were running compound.

The company generate their own power, and for this purpose have installed two Curtis inpulse type steam turbines which are direct-connected to 300 K.W. D.C. generators 125-250 volt, three wire, and run at 1800 r.p.m. These sets were supplied by the Canadian General Electric Co. The six panel switchboard is equipped with the usual instruments and was supplied by the Canadian



GENERAL ARRANGEMENT OF FURNACE, SKIP BRIDGE AND BIN SYSTEM.

General Electric Co. A 10-ton overhead hand travelling crane, built by the Euclid Crane Co., Cleveland, Ohio, serves the power house.

On one side of the power house is the pump pit, containing the pumps, condensers, etc. The condenser was supplied by the Deane Steam Pump Co., Holyoke, Mass., who also supplied a duplex type condenser pump, 20-26--24 in. A Cochrane heater provides feed water at 130 degrees Fah. The heater was supplied by the Canadian Allis-Chalmers Co., and in connection with it are two Worthington 12-17-12 in. boiler feed pumps, duplex type. The stand pipe is fed with water from the lake and for this purpose two Worthington 16-18-18 in. duplex steam pumps have been installed. The stand pipe located between the power house and the furnace is of steel construction, 18 ft. diameter and 65 ft. high, and was supplied and erected by the Canadian Allis-Chalmers Co.

General Features.

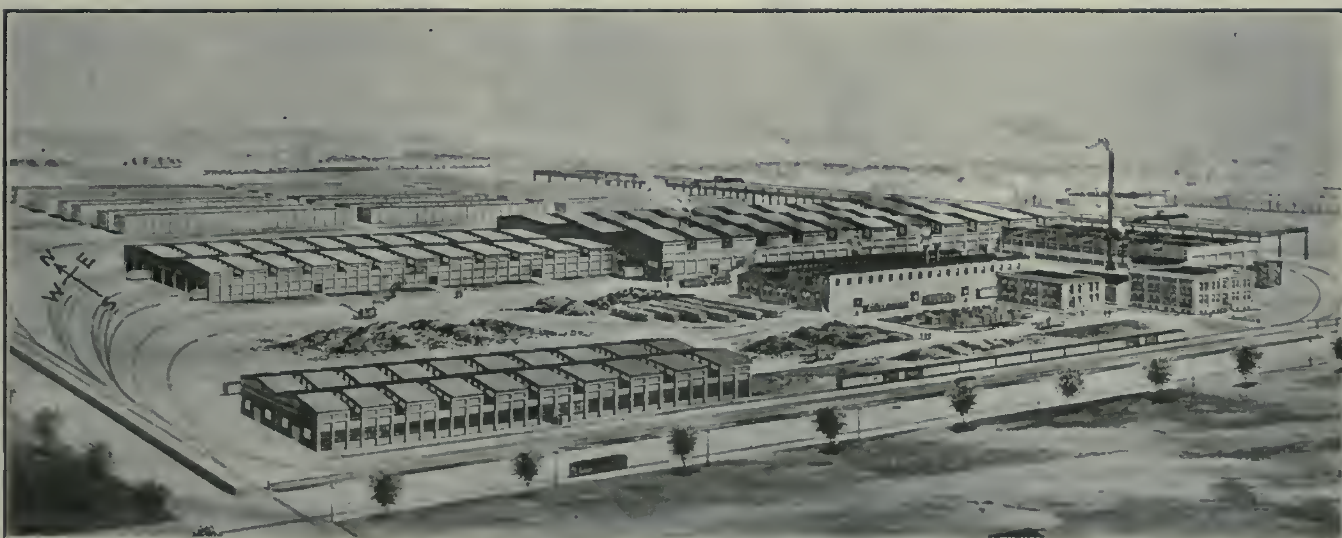
The blacksmiths' shop is located near the stoves and is being equipped with the usual tools, fires, etc. A machine shop is contemplated and will be built near the stock house. The yard locomotives were supplied by the Baldwin Locomotive Co., Philadelphia, and the American Locomotive Co., Schenectady, N.Y.

The plant is under the supervision of Mr. B. Marron, the general manager, who also holds a like position at the Buffalo plant. Mr. Marron has been with the company 12 years, being previously with the Illinois Steel Co. The other officers of the company are Frank. B. Baird, president; Harry Yates, 1st vice-president; C. C. Collins, 2nd vice-president; R. F. Schelling, secretary; M. A. Hanna & Co., Cleveland, Ohio, are the exclusive sales agents for the product of the furnace.

NEW CAR SHOPS AT FORT WILLIAM.

THE new plant of Canadian Car & Foundry Co., Ltd., at Fort William Ont., is rapidly approaching completion and is one of the most important industries now located in that thriving city. Work was only really started on the plant in October, 1912, although the ceremonial turning of the first sod took place sometime previous to that date. The various buildings are now all erected and covered in, and the bulk of the equipment is installed.

The plant stands on a site of 84 acres at the west end of the city, near the Canada Iron Corporation foundries and the new nail and spike mill of the Steel Company of Canada. The site has a frontage of about 400 feet along the Kaministiquia River, with a wharf 270 feet long, enabling raw material to be brought in entirely by water. A portal crane by the Brown Hoisting Machinery Co., runs along the wharf and transfers material from the steamers to cars. The crane is equipped with a generator and lifting magnet for handling pig iron.



CANADIAN CAR & FOUNDRY CO. PLANT AT FORT WILLIAM, AS IT WILL APPEAR WHEN COMPLETED.

The main shop runs east and west and is 900 feet long by 240 feet wide. This space is divided up into six departments, viz.:—Planing mill, 500 ft. x 80 ft., steel fabrication, 500 ft. x 80 ft.; bolster shop, 260 ft. x 80 ft.; truck shop, 240 ft. x 80 ft.; forge shop, 400 ft. x 80 ft.; steel car erection shop, 400 ft. x 80 ft. and wood car erection shop, 400 ft. x 80 ft. At the west end of the two last named departments are the steel car and wood car paint shops, each 700 ft. x 80 ft. At the east end of the main shop, and at right angles to it, is a stock yard served by a 10-ton crane of 80 ft. span on a runway 1,020 feet long. It will thus be seen that raw material moves in a continuous line from stock yard to erection shop and thence to the paint shop, the finished cars emerging from the west end of the latter. All these buildings are heated by four batteries of steam coils arranged along the north side of the shops. These coils take exhaust steam from the air compressors in the power house, live steam being used when the compressors are idle. Air is drawn through the coils by a hot blast fan and conveyed by underground ducts to openings at the bottom of the shop columns. The whole of the heating apparatus is placed underground for the sake of economizing space. When the plant is enlarged, the extensions will be made in a northerly direction, but the present heating units will remain where they are and will then be in the middle of the shops.

The machine shop and power house are adjacent to one another and lie at right angles to the south-east side of the main shop. The power house is of special interest. It covers an area of 175 ft. x 110 ft. with allowance for future extensions to the south. All machinery throughout the plant is electrically driven, 3-phase alternating current at 550 volts, 60 cycles, being generated by three Allis-Chalmers generators, each of a nominal capacity of 600 k.w. Each generator is built for a 25 per cent. overload and is direct connected to a producer gas engine by the Mesta Machine Co. There are four double sets of gas producers installed by R. D. Wood & Co., Philadelphia, each being capable of gasifying 1,800 pounds of bituminous coal per hour, the coal all being handled mechanically. The gas producers make water-gas or ordinary producer (blow-up) gas as required. The blow-up gas has a heating value of about 110 B.T.U. per cubic foot, and the water gas of 300 B.T.U., the richer gas being employed for heating the furnaces in the forge shop and elsewhere. while the blow-up gas is used in the gas engines. Water gas is becoming increasingly popular for furnace heating on account of the advancing cost of fuel oil. In the process of making water gas the poorer blow-up gas is necessarily formed, and in many plants is allowed to go to waste, whereas it might be usefully employed for producing power, as is done here.

Further equipment in the power house includes an exciter set of 250 k.w., consisting of a Canadian General Electric generator direct connected to a Robb-Armstrong vertical high speed engine. Four Robb-Mumford water tube boilers of 250 h.p. each have been installed. These will be fired by scrap wood from the planing mill and will supply steam to two Canadian Ingersoll-Rand two-stage cross-compound air compressors of 3,000 cubic feet capacity at 100 lbs. pressure. The switchboard is by the Canadian General Electric Co. and contains twenty-six marble panels. There is independent control of both lighting and power in each department.

The power house and machine shop being in line, one overhead traveller serves both departments. There are eleven overhead cranes throughout the plant, all of 10 tons capacity and all built by the Dominion Bridge Company, Montreal. All parts of these cranes are accurately interchangeable.

Parallel with the main shop is the foundry building, now rapidly nearing completion. The grey iron foundry is 160 feet in length and the wheel foundry 220 feet, the width of both being 145 feet. The daily output of the grey iron foundry will be 30 tons and of the wheel foundry 350 wheels.

The arrangement of the various departments and machines in the main shop has been very carefully thought out with a view to saving all lost motion in moving material through the shop. Thus, the air dried lumber piles are to the north of the shop, the lumber entering the planing mill through a 60-ft. opening at the east end of the north wall. The lumber then passes down a line of borers, mortisers, etc., arranged along the north side of shop, and thence to the wood car erection department. The lumber to be kiln-dried is stored at the east end of the site and after removal from the kilns enters the planing mill at the east end. It then passes along a line of machines on the south side of the mill.

Owing to the present temporary lull in business the completion of this plant is not being rushed; but when it goes into full operation, as it is hoped it will do next spring, the output will be 30 cars per day.

WHARF ON KAMINISTIQUIA RIVER—CANADIAN CAR & FOUNDRY CO. NEW CAR PLANT AT FORT WILLIAM, ONT.

Material being handled by a Portal Crane equipped with Electro Magnet.

CANADIAN LOCOMOTIVE CO.

THE Canadian Locomotive Co., Kingston, Ont., has been coming along very nicely during the year, even under the less active industrial conditions, and it is understood that at the present time there are contracts on the books sufficient to carry the plant through in full operation until about March 15th.

WINDSOR, ONT., FACTORY DISTRICT.

SATISFACTORY progress has been made during the year in the Windsor, Ont., factory district. In addition to the plants already established, there are several other concerns who have already commenced building operations, or are about to do so in the near future.

The city has appropriated a large tract of land on the south side of the municipality, and formed two factory districts, one comprising an area of 40 acres, which is practically all taken up, and another which covers an area of 23 acres.

In the No. 1 factory district the Swedish Crucible Steel Co. of Detroit have already started work on the foundations for a plant for the manufacture of steel castings for automobile parts, agricultural implements, springs and drop forgings, etc. Four acres have been purchased and two storey buildings will be erected and equipped with modern machinery. The capital of the Company is $100,000, and it is estimated that 100 men will be employed. In the same district the Detroit Steel Products Co. and the Vincent Steel Process Co. have purchased sites, and it is expected that work will be commenced on the foundations in the spring.

In the No. 2 factory district three acres have been sold to the Ontario Steel Products Co. This concern have plants in other parts of Canada, but are going to build a factory at Windsor for the manufacture of spring-making machinery and special machine tools for making dies for this purpose. The initial building will be 175 x 60 ft., and provision will be made for extensions without interfering with the plant operation. It is proposed to instal a power plant for using natural gas. The Windsor factory will be a branch of the Dowsley Spring and Axle Co., Chatham, which is owned by that Company.

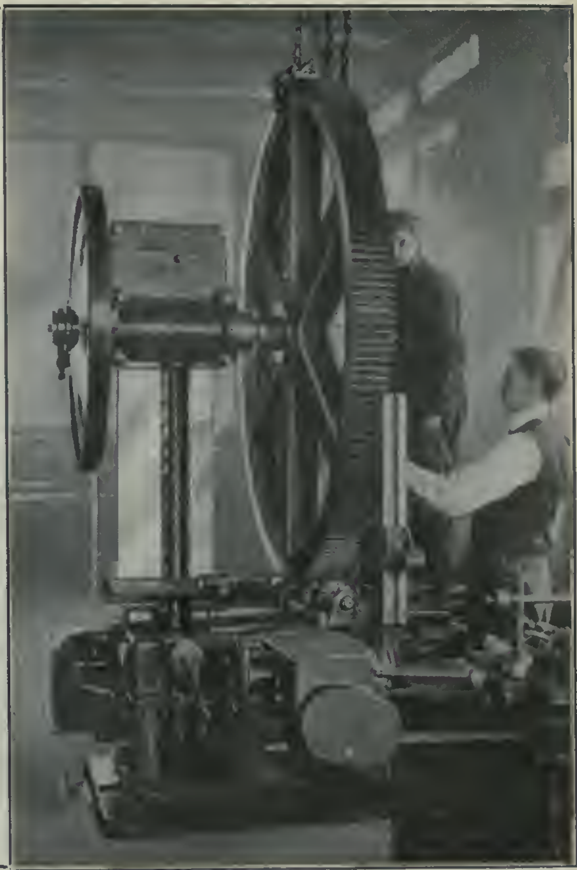
Another Company who are proposing to locate in this district is the Windsor Power Building Co., Ltd. It is the intention of this Company to build a modern reinforced concrete, fireproof factory building, five storeys high, and having a total floor space of 50,000 sq. ft. The building will be let for manufacturing purposes, and being located near the Essex Terminal Railway, good facilities will be provided for shipping. The Company is capitalized at $150,000, and the representatives in Windsor are E. T. Post and W. W. Smales, both of Staunton, Va.

Mr. C. F. Barker, the Industrial Commissioner of Windsor, reports a number of inquiries for factory sites. The advantages of Windsor as a manufacturing centre are becoming widely known, its location being one of the principal reasons.

Plant of the Hamilton Gear & Machine Co. Toronto, Ont.

— STAFF ARTICLE —

A new and up-to-date plant, the principal product of which is cut gears. Some interesting features of factory building design and of machine drives. Departments and equipment placed in convenient relative positions. Description of machine tool equipment. Planing bevel gears. The hardening room a leading feature.



THE Hamilton Gear & Machine Co., Toronto, Ont., claim to be the only real gear shop in Canada, and the plant, which was recently inspected by a representative of Canadian Machinery, is substantial evidence to that effect.

The business was started two and a half years ago by Chester B. Hamilton, Jr., B.A.Sc., graduate in Mechanical Engineering of the University of Toronto, who has had quite a varied engineering experience, considering his years.

Building Features.

The plant is housed in a heavy reinforced concrete building designed especially for the nature of the work to be done. While the good qualities of this material as regards low depreciation and freedom from fire risk are generally conceded, there is a more important point sometimes overlooked—that of its almost ideal adaptability to special requirements of design. For example, in this plant the heavy longitudinal beams at the sides of the building extend above the second floor or roof as a parapet, their bottom edge being level with the bottom of the secondary cross beams. Thus, over two feet of additional window height is obtained, which is very desirable in a wide shop. Another interesting point is the method of supporting the steel crane girders. These are carried on heavily reinforced brackets moulded integrally with the columns. The supposed difficulty of attaching minor fittings to concrete, which is often considered a disadvantage in this type of structure did not prove serious. A. H. Harkness, Consulting Engineer, Toronto, was the designer of the building proper, while the plant was laid out by Mr. Hamilton.

The building is on a corner, with entrances on three sides and light and ventilation on all four. It is divided into three bays with office and store room across the north end. The centre and west bays contain the machine shop, and each bay is served by a 2-ton overhead travelling crane, running the full length of the shop.

Drives for Machines.

Most of the machines are either driven by individual motors or belted directly to Dodge clutch pulleys on the line shaft. This dispenses with counter shafts and two-thirds of the belting which would otherwise be required and leaves the shop clear for efficient crane service. The motors and machines are so located that all the main drives are tight on the under side of the belt and run very slack.

The method of carrying a line shaft from the crane girders is shown in Fig. 2, which also indicates how the crane is arranged for maximum headroom. The electric conduits are carried partly along the crane girders and partly under the floor, with outlets at each column.

Departmental Layout.

The third or east bay contains the pattern shop tool room, heating apparatus and the hardening room. The building is heated by hot air with fan, using elevated steam coils. These with the fan are carried in a structural steel frame close to the ceiling, with the double advantage of saving floor space and needing no return pump, all condensation draining back directly to the boiler. The fan is run in summer as well as winter, for ventilation. The air is distributed through elevated sheet iron ducts, with branches leading down to within a few feet of the floor. The general lighting is by gas arcs. Individual electric lamps are now being placed on some of the machines.

Pattern Shop.

The pattern shop is small, but conveniently arranged and well equipped. It contains the usual bench, laying-out table, band saw, trimmer and lathe. The latter is of double ended spindle construction for turning large wheels on a face plate at the left end of the head.

There is a standing rule in this department which is worthy of more general application, i.e., all shavings and scrap must be cleaned up every night.

Most of the work is on spoked blank wheel patterns of standard design. Like most other things, there is one right and a good many wrong ways of building these patterns, but fortunately in this case the way that is best in the end is also the easiest.

Tool Room.

The tool room is one of the most important parts of a plant of this nature, and one usually much neglected in small shops. In the present case, it has been developed very carefully. One whole side is of glass with no obstructions to cast shadows; and the other three are wire mesh partitions. Compressed air and gas are piped along the bench. This department contains an F. E. Reed tool room lathe, an ordinary tool grinder and a LeBlond Universal cutter grinder.

FIG. 2. CRANE BRACKET AND SHAFTING ARRANGEMENT.

An essential feature of the gear business is the large stock of cutters and hobs needed, and which must always be kept sharp. These are practically all of high speed steel. After sharpening, every cutter is tested in a special fixture as to whether the front faces have been ground truly radial and for equality of height of the teeth. A stock of ready sharpened tools for the lathes is kept in the tool room. These are ground in jigs to Taylor standard shape.

There are no permanent shelves in this room, all the tools being arranged in cabinets and small shelf sections which can be easily re-arranged in different locations to suit expansion without disorganizing the general plan.

Lathes.

The lathe department occupies the south part of the middle and west bays. The engine lathes are of F. E. Reed and R. McDougal Co. make, one of the latter being a large gap lathe. A Jones & Lamson turret lathe, size 3 in. x 36 in., with individual motor is used for repetition work, and gives thorough satisfaction. As this machine has no compound rest or diagonal feed as ordinarily constructed, it might be thought that it would be at a disadvantage on such work as wide-faced cast iron bevel gear blanks, but this is not the case. A roughing formed tool with a corrugated cutting edge is used to act as a scale breaker and is followed by a finishing formed tool. It is found that cast iron bevels can be turned very rapidly, even with extra wide faces, by forcing these tools directly up to the work without lateral feed.

High speed steel is used exclusively, both for turning and drilling. All drills are of the concave twisted type, which combine the advantages of form of the milled drill and the high duty of the flat twisted type. The use of taper shanks one Morse number larger than standard has been found a great advantage.

In this department there is a new, motor driven high speed saw, having a capacity of 9 inches diameter. With this machine, large steel pinion blanks can be got out on a few minutes notice. A full stock of a high grade of open hearth steel bars is kept on hand besides a fair amount of the more expensive alloy steels for automobile and special gears. A good stock of rough rawhide blanks and partly machined brass flanges is also carried from which rawhide pinions can be made up on short notice of any face and any diameter up to about nine inches. A large range of lengths and diameters of soft steel rivets is an important item in getting out rawhide pinions economically and promptly as those most used are over the ordinary lengths.

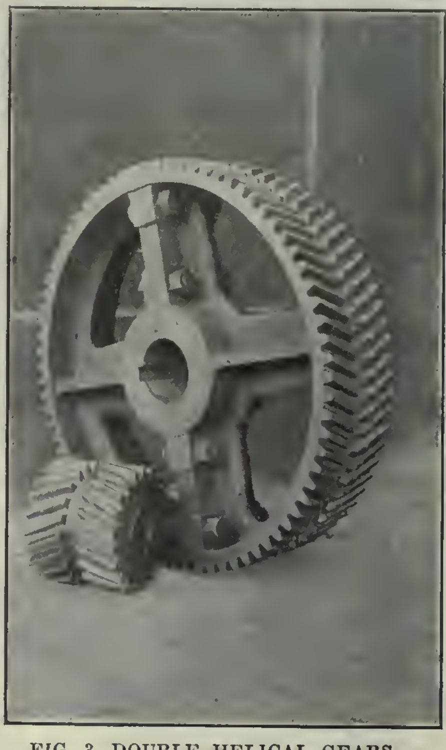


FIG. 3. DOUBLE HELICAL GEARS.

At the middle of the shop, between the lathe and gear cutting sections, are located the shaping, drilling and key seating machines. The use of a special key-seating machine far out-classes the shaper or slotter for convenience, accuracy and speed. The machine used in this shop can handle work up to 8½ feet in diameter.

Spur Gears.

Spur gears are cut on Brown & Sharpe 84 in. and Gould & Eberhardt 48 in. machines. These are in the north part of the west bay, all bevel gear machines being in the north of the centre bay. Some very heavy work has been turned out by this shop, which is natural on account of the ample equipment to handle it. Next to the spur gear machines is a Kearney & Trecker, Milwaukee, "all-geared drive" universal milling machine. With a special head and some additional fixtures, this machine provides means for cutting helical and double helical gears up to 4 feet in diameter, and racks up to 10 feet in length.

Helical Gear Production.

Far greater exactness of work and especially of calculation is required for helical gears than is generally supposed. For double helical gears, such as those illustrated, an additional pair of compound change gears, having the same ratio as those being cut, is inserted in the lead gears when cutting the gear. These are omitted when cutting the pinion and the balance of the train of lead gears left unchanged, thus maintaining the correct ratio of leads of gear and pinion beyond possibility of error.

There is also equipment for hobbing worm wheels up to 9 feet in diameter.

Bevel Gears.

The part of the shop devoted to bevel gears is equipped entirely with Gleason machines. These comprise a 60-inch gear shaper, a 24 inch gear shaper, an 18 inch bevel gear generator and a bevel gear testing machine. The first two named are similar in construction. A single tool is used which planes the gear tooth to a curve copied from a templet. A roller, travelling on this templet is mounted at the rear or free end of the shaper guides. The guides swivel at the front end, both vertically and horizontally about a point which agrees with the cone centre of the gear being cut. With the tool properly located, every cut taken is on a line leading directly to the cone centre of the bevel gear. Three changes of tools are needed for each gear, a stocking tool and finishing tools for the upper and lower sides of the teeth. Correspondingly, there are three templets used, the first of which has a straight edge.

The 60-inch machine is equipped with templets for teeth of 20 degree pressure angle as well as the usual 14½ degree. The 20 degree is a stronger tooth than the 14½, especially in the case of pinions for high ratios and small numbers of teeth, as it avoids much of the undercutting of the flanks of the teeth usual in these cases. It is also the better form for patterns from which moulded gears are to be cast, as it draws from the sand more readily than the 14½ degree.

Bevel Gear Generator.

The bevel gear generator is a double tool machine and uses no templets. It forms the tooth mechanically by the "moulding generating" process. The tooth being cut is rolled between the two straight sided tools. These travel back and forward while the machine rolls, and thus form a theoretically correct tooth. As the tooth is shaped by the side of the tool taking a thin paring or shaving cut, it follows that a very high finish is obtained by this method as well as extreme accuracy. This machine is also equipped for the 20 degree tooth as well as the usual form.

The generator is a very fast cutting machine for work within its range, but it requires longer to set up, hence its field lies in repetition work. The single tool gear shapers are more efficient on small quantities and are the best for the general run of work.

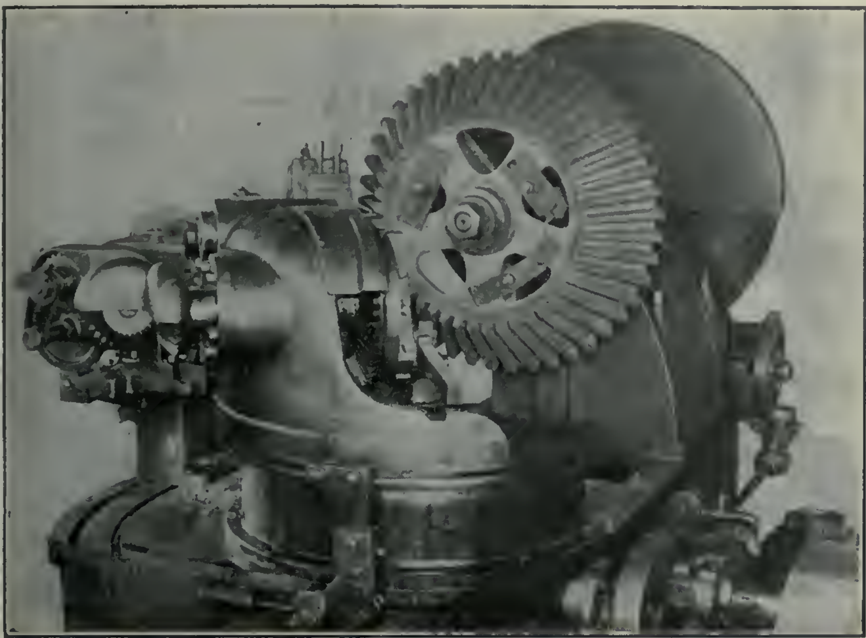


FIG. 4. LARGE BEVEL GEAR ON 60-INCH GLEASON PLANER.

Bevel Gear Testing Machine.

The bevel gear testing machine consists of a frame in the form of an exact right angle, each leg of which carries a headstock and spindle which can be accurately adjusted along the slide. By this means, a pair of bevel gears can be mounted at right angles and in the same plane, and the depth of meshing, adjusted as desired. One of them can then be driven forward or backward and a brake applied to the other; red lead can also be used on the teeth to indicate whether they are bearing evenly. These tests are for accuracy of workmanship solely. Strength tests are only made on quantity work, when a sample is taken and tested to destruction.

One of the principal difficulties met in doing a general line of bevel gear cutting is the matter of errors in blanks sent in by customers. The blanks are frequently incorrectly turned and unnecessary trouble ensues. On the other hand, men who are turning gear blanks continuously do this work with ease and accuracy.

The Hardening Room.

The well-equipped hardening room is one of the most interesting parts of the plant. A hardening department can give a greater range of good results or trouble than almost any other branch of mechanical work, and a complete but not too elaborate equipment is absolutely necessary for success.

A large Brown & Sharpe furnace is used for case-hardening and heat-treating gears or other steel parts. The door is 12 inches high by 24 inches wide and the oven is 4 feet 10 inches deep. It is of very heavy constructions, slow to heat up, but giving constant and reliable results when once heated. It burns Lehigh egg coal with an air blast, consuming about 150 pounds per day, and an

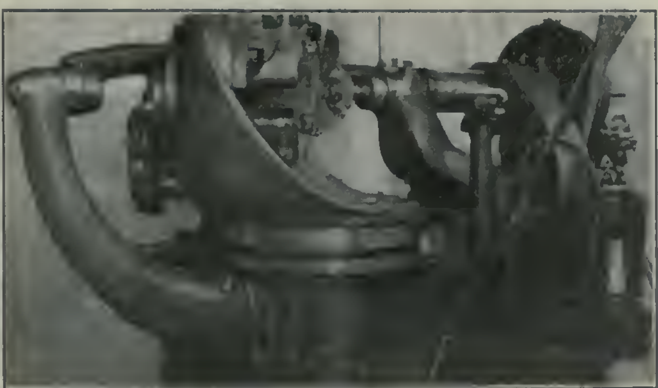


FIG. 5. BEVEL GEAR GENERATOR.

FIG. 6. BEVEL TESTER.

additional 100 with natural draft at night.

Only one heat of steel per day is put through. The work is packed in semi-steel boxes in the carbonizing material, which may be bone or one of the manufactured chemical compounds, and the lid sealed with clay. The boxes are placed in the furnace at 5 o'clock, and removed about the middle of the following afternoon. This slow heating is a much surer and safer way than the short quick heat commonly practiced. The steel is allowed to cool slowly in the sealed pots and is not unpacked till the following day when it is reheated and quenched to harden. After this, it may, if desired, have the temper drawn.

The temperature and length of time for which the steel is carbonized depend on the kind of steel, the thickness of case and the carbon content of the case desired. The temperature to which it is reheated, the kind of quenching liquid and the temperature at which the temper is drawn also vary with the kind of steel and the work for which it is intended. Figure 7 shows the bins of carbonizing material at the left. The main stock of this is of course kept in the store room. Above the bins is the electric pyrometer indicating temperatures in the furnace.

In front of the furnace are a couple of empty carbonizing boxes and to the right is the oil quenching tank. This is provided with a water jacket through which cold water can circulate from the bottom and overflow to the sewer. A compressed air pipe at the bottom of the oil tank keeps the oil agitated so that it gets the full benefit of the cooling jacket. There are also brine and running water tanks, one of which is 6 feet deep, for quenching long pieces endways. Large pieces of steel are handled with overhead pulleys and there is a trolley and run-way for removing the hot pots from the furnace.

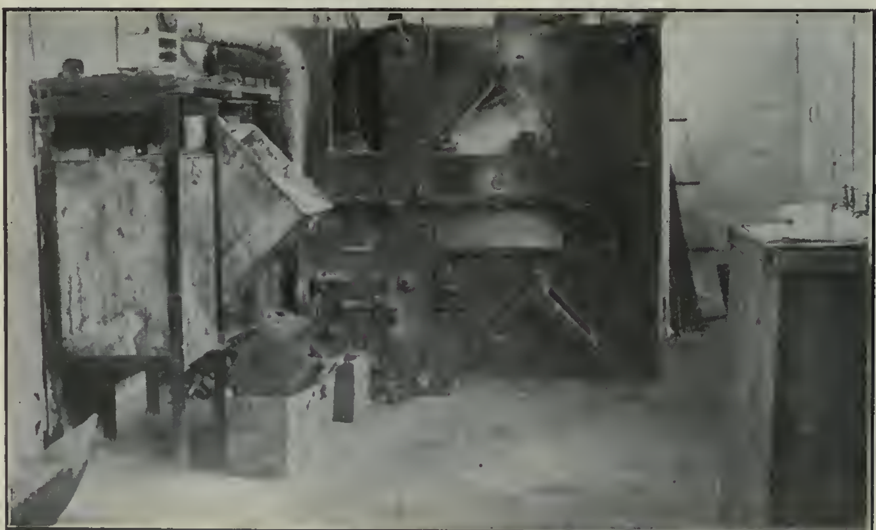


FIG. 7. HARDENING ROOM, GEAR END.

Tool Furnaces.

The other end of the hardening room, Fig. 8, is devoted to tool work. Besides the ordinary forge equipment, a small gas fired tool furnace with pyrometer connection is shown at the right. This furnace is not capable of treating high speed steel, and its use is therefore limited. The high speed steel furnace is shown at the left.

FIG. 8. HARDENING ROOM, TOOL END.

After looking over the various furnaces on the market, it was decided to build one on original lines. This was done and it has proven a success. The fuel, coke, is fed from an elevated hopper in the rear to grates in a very deep fire box. This attains two ideals at once —a continuously replenished fire which is never dulled by fresh fuel, and a deep fuel bed which prevents oxidation of the steel tool. The furnace is very cheap to operate and behaves more like an oil than a solid fuel furnace. Tools must of course be pre-heated slowly in a moderate fire to avoid the injury that would be sure to result from exposure of cold steel to intense heat.

Employes Safety.

There is one point concerning this plant deserving of special mention; that is, the question of personal safety. Great pains have been taken to secure conditions of safety on every side. There are neither projecting set screws, unguarded gears nor dangerous belts in the plant, and the liability insurance rate is, we are informed, the lowest in the Province. While it will probably never be possible to make a machine shop "fool proof" there is no reason why it should not be made reasonably "danger proof" for the mechanic of even average intelligence.

THE DIAMOND MFG. CO., LTD.

THE Diamond Mfg. Co., Ltd., have leased parts of two floors in the Walker Power Building at Walkerville, Ont. The total floor area occupied by them is 6,540 sq. ft., and equipment is being installed for manufacturing automobile radiator parts, wind-shields, lock steel tubing and weather strips for buildings.

On the first floor are installed a number of machines for making the necessay tools, dies, etc., while on the ground floor, special machinery will be installed for manufacturing the product. Operations were started in October of this year. The Diamond Mfg. Co. of Detroit, Mich., is the parent concern. Mr. Newman is manager of the Canadian Company.

Plant and Product of The Ford Motor Co. of Canada, Ltd.

Staff Article

The automobile industry in Canada has in recent years shown much vitality, and the chief feature of this development has been the factory built by the Ford Motor Co., of Canada, Ltd., at Ford, Ont. It is the largest of its kind in the Dominion, and this article will no doubt be read with keen interest on account of the popularity of the Ford Car.

THE history of the Ford Car has been one of phenomenal success, and a visit to the Canadian home of the "Ford" will in a great measure explain the reason for this. The reasons which are perhaps chiefly responsible for this success are standardizing the design of the car together with efficient manufacturing methods and organization. The growth of the company since its inception, nine years ago, is an indication of the success that has been attained.

The Ford Motor Co. of Canada, Ltd., was organized in 1904 by the Ford Motor Co. of Detroit, Michigan, who even at that time were operating a large factory in the latter city, and have since increased enormously both the plant and the output. The first car was shipped from Walkerville, Ont., in 1905, and since that date the progress has been both rapid and continuous, so much so, that in 1910 a three-storey concrete building, with about 19,000 square feet of floor space, was built and completed in January, 1911. In the same year, another reinforced concrete building was erected, having four floors 75 feet by 200 feet, containing 60,000 square feet of floor area, and built over the river bank. A new office building was also built this year.

In 1912 the capital stock of the Company was increased from $150,000 to $1,000,000 and the name changed to the Ford Motor Co., of Canada, Ltd. About this time, the district in the vicinity of the factory was incorporated as a town and given the name of Ford. This district adjoins the town of Walkerville, but the town of Ford has a separate municipal organization. In 1902 another concrete factory was built 75 feet wide by 505 ft. long and was a continuation of the 1911 building. This extension completed the main building which is now 705 feet long by 75 feet wide, and is built parallel to the river. The Company have a site covering 60 acres situated on the Detroit River and have a siding connection with the Grand Trunk and Essex Terminal Railway. On that part of the property across the main road and directly opposite the factory, a modern power house and boiler room have been built. The location of the plant is good as cheap power in the form of natural gas is used and shipping facilities to the various markets are of the best.

The Ford Car.

The Ford Car is made in three styles, a runabout, seating two passengers, a town car seating six persons, and a touring car carrying five people. In each case, however, the chassis and power plant are the same size and design, the rating being 20 h.p. It is thus possible to standardize the design and simplify methods of manufacture. This has been the aim of the Company from its inception, and has been largely responsible for the large output each year; 20,000 cars being the estimate for next season.

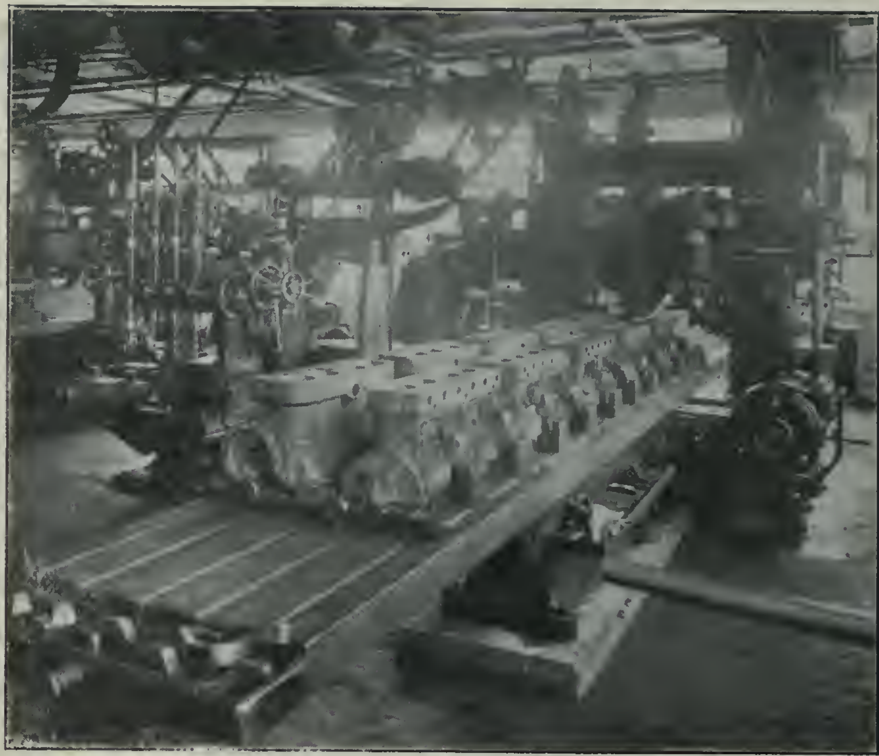
The company have embodied some

GENERAL VIEW OF PLANT—THE FORD MOTOR CO. OF CANADA, LTD.

distinctive features in the design of the car, the principal being the "Ford" magneto, which is made by the company, the use of vanadium steel for gears and crank shafts, etc. The left hand drive is employed for cars used in Canada with the exception of British Columbia, the Maritime Provinces and foreign countries where the right-hand drive is used. Planetary type transmission has been adopted as standard. Many of the component parts used in the car are made by various companies in Walkerville and district who specialize in certain parts, such as wheels, castings, drop forgings, bodies and tops. The total floor space occupied by these companies for the manufacture of the parts named is nearly equal to the floor space at the Ford factory. This feature will serve to show the extent of the Ford Company plant and connection.

Building Features.

The large main building was erected by Wells & Gray, Contractors, Toronto, and is 705 ft. long by 75 ft. wide, and four storeys high. It is of reinforced concrete and brick construction and as fireproof as it is possible to make it. The windows are fitted with "Kahn" steel sash and ribbed glass, extending all round the building and admitting plenty of light, thereby giving a very bright and pleasing interior effect. Hardwood floors are laid throughout, and dust is practically eliminated. As an additional precaution against fire, an automatic sprinkler system has been installed throughout by the Automatic Sprinkler Co., of America. On the roof are two water tanks having a capacity of 25,000 gallons and 40,000 gallons respectively.



MILLING CYLINDER CASTINGS—TOPS AND SIDES.

The buildings are heated by a forced circulation of hot water which is pumped from the boilers to four coils on the roof. Air is drawn over the coils by fans and is blown through ducts on the roof of the building to the several columns which are hollow, and equipped with register openings. A constant temperature of 65 degrees Fah., is maintained at all times. Four 5-ton Otis-Fensom electric elevators have been installed in the main factory building.

There is a bell system installed on each floor which consists of two 10-in. gong bells placed in suitable positions. The bells anounce the factory hours and can be used for fire calls. For the lighting system 60 watt "Bergman" lamps are installed throughout.

The comfort of the employes has been well taken care of. On each floor are rows of lavatories, and sanitary drinking fountains are located at various points. The different departments on each floor have each a time recording clock which were supplied by the International Time Recording Co., Toronto. A covered passage connects the main building with the office block.

Part of the old building is still being used. On the ground floor is the blacksmith shop, a general store room, and shipping room. On the 2nd floor are the shipping office and superintendent's office, and the third floor is devoted to the manufacture of radiators.

GLEASON GEAR CUTTING AND SHAPING MACHINES.

Machine Shop.

On the ground floor of the main building is the machine shop which occupies the whole area. This is perhaps the most important department both from a production and investment standpoint. In this shop, jig work and methods of production have been reduced to a science. There are a number of special machines designed by the Company for their own particular requirements, in addition to those of standard make, and which are found in every up-to-date machine shop.

At the east end of the machine shop is the tool room where jigs and special tools are made for the various operations connected with the machining of the engines, etc. Some of the machine tools employed for this work have been specially designed for the purpose, the rest include standard tools such as Brown & Sharpe universal milling machines, Warner & Swasey turret lathes, multiple drills by the Foote Burt Co., Cleveland, lathes by the Hendey Machine Co., Torrington, Mass., drills by the Cincinnati Bickford Co., Cincinnati, and No. 2 milling machine by Kearney & Trecker Co., Milwaukee. High speed steel is used in this department for making cutters, etc., and the work is inspected at frequent intervals to ensure accuracy.

The machine shop is divided into sections so that no stock traverses the whole length, each part being kept in its own particular section. There are sections devoted to machining cylinders, pistons, crank cases, crank shafts, gears and small parts like cam shafts and transmissions. To facilitate the operation of this system, three electric freight elevators have been installed by the Otis-Fensom Co., to carry stock up to the assembly floor above and to bring the finished cars down. An overhead runway extends the full length of the shop and carries a 2-ton Sprague electric hoist. The larger machines have independent motor drives while the others are grouped in their respective sections and operated from a motor driven line shaft. The motors in this shop were supplied by the Canadian Westinghouse Co., and vary in size from 25 h.p. to 40 h.p., according to the number and size of machines in the sections.

The heaviest machinery is grouped at the west-end where the motor cylinders are machined. The cylinder castings are taken from the stock room to a large milling machine which finishes in one operation the sides and bottoms of ten cylinder castings or forty individual cylinders. This is a horizontal machine and was made by the Ingersoll Milling Machine Co., Rockford, Ill.

The cylinder heads are machined on an Ingersoll Miller, and the bottoms of the cylinder castings finished on a machine of the same type. The four cylinders in one casting are bored, at one operation, on a 4-spindle boring machine, which is equipped with a rising table to take care of the feed. After being bored, the cylinders are reamed and finished on a similar machine to the above. The next operation consists of drilling the cylinder castings, which is done in a number of multiple drilling machines, having four, six, twelve or sixteen spindles, the majority being supplied by the Foote-Burt Co., Cleveland, O., and the Cincinnati Bickford Co. One special Foote-Burt machine drills forty-one holes in a single casting at one operation.

Next to the cylinder section of this shop are several piston machines which in a single operation face the piston tops and sides and grooves for the rings of four piston castings at once. The piston is then practically finished and ready for the stock room with the exception of letting in the bronze bushing for the wrist pin.

In the next section are the Gleason gear cutting machines for machining the differential drive gear and pinion. There are ten of these machines in one row which first make the roughing cut on the gears. In the next row are fourteen Gleason gear shapers, which make the finishing cuts. The cutters take the gear blank and cut the required number of teeth, coming back automatically to the next starting point, as between operations, the gears must be heat treated.

There are of course a number of machine tools involved in the various operations carried on in this shop, and in addition to those already referred to it may be of interest to mention a few of the others. It should be stated that there are in some cases several of one type which include hobbing machines by the Barber-Coleman Co., Rockford, Ill.; Brown & Sharpe milling machinery, lathes by Hendey Machine Co., Landis No. 3 grinders, Warner & Swasey turret lathes, grinders by Fox Machine Co., Grand Rapids, a Gould & Eberhardt milling machine for machining bearing caps, Milwaukee milling machines and Kearney & Trecker milling machines. A large number of these machine tools were supplied through the A. R. Williams Machinery Co., Toronto.

MULTIPLE SPINDLE CYLINDER DRILLING MACHINE.

Assembling Shop.

The second floor, that immediately above the machine shop is taken up by the painting and motor assembly departments; there is also a store room for finished parts. In the painting department there is a wheel painting machine which was supplied by the Detroit Tool

Co. This machine has the appearance of a centrifugal dryer, and revolves the wheels in successive tanks of paint and varnish. After this operation, they are taken out and dried and then fitted with tires and sent along to the final assembly. The other parts are all painted by hand.

The greater part of this floor is taken up by the motor assembly section where the different parts are carefully fitted together. First, the crank and timing gear are fitted to the cylinders, then the magneto and transmission are bolted in place. When completed the motors are placed on a test stand, of which there are five, and are then connected to an electric motor and run at a high speed. This operation in addition to being a test for the engine and magneto provides an opportunity for "running in" the bearings and making necessary adjustments. Each testing set is equipped with a switchboard fitted with an ammeter and voltmeter. The "Ford" magneto is assembled in this shop. At the west-end of this floor is the store room for finished parts in connection with the motor assembly.

MACHINING ENGINE CYLINDER BOTTOMS.

Final Assembly.

On the third floor is the final assembly where the chassis, including power plant, frame, front and rear axles, wheels and bodies are put together. In assembling the cars, each man has his particular work to perform, moving from one car to another as his work is completed. This system enables the maximum speed to be attained with the greatest degree of accuracy. When the cars are completed they are taken down to the testing room where the rear wheels are jacked up and the final test run. If required for immediate shipment they are taken to the shipping room, if not, which is rarely the case, they are taken up to the top floor of the main building and held until required.

At the west end of the final assembly department is a store room for finished parts which are carried to the assembling department by a portable crane hoist supplied by W. S. Nicholls, New York. Leading from this floor but in the older building is the radiator department where the "Ford" radiators are made. Each stage of manufacture can be seen from the plain brass sheets to the painting of the finished product which is done by a compressed air spraying machine.

The fourth or top floor of the main building is used entirely as a stock room for such parts as motors, bodies, tops, etc., and occasionally for finished cars.

Heat Treatment.

On leaving the main building we pass along outside to the heat treatment department where one of the most important operations relative to the product is carried out. As already stated, vanadium steel is used in the Ford cars. All parts made of this material must receive special heat treatment before being assembled in the cars; this is done by heating them in specially designed furnaces at a certain temperature, for a definite time, to give them the necessary toughness and elasticity. There are eight of these furnaces built of brick, heated by natural gas, and equipped with electrically controlled pyrometers.

On the opposite side are the furnaces for brazing brass parts, such as radius rods. In another section are the babbitting machines, six of which surround a ladle of molten babbitt heated by natural gas. Into these machines are fed the connecting rods whose crank pin boxes are lined with babbitt. Alongside the wall in another section are a row of blacksmith's fires, where crank shafts and front axles, etc., are straightened. In this shop are the furnaces for tempering the differential and transmission gears. The shop is part of the old plant, but a new heat treatment building is being erected adjoining the present one.

HEAT TREATMENT DEPARTMENT.

Power Plant.

Crossing the road we come to the power house which is a brick building of handsome appearance and about 60 ft. square. The roof trusses are steel with a concrete roof. The windows with steel sash extend almost the full height of the building and on three sides. The walls inside are lined with white glazed brick, with the result that this is perhaps the brightest and cleanest power house t obe seen anywhere. The equipment generally is of the most modern type.

The power installation consists of two horizontal gas engines made by the Hooven, Owens & Rentschler Co., Hamilton, Ohio, to the designs of Edward Grey, an engineer on the staff of the Ford Co. at Detroit. Both engines are identical in design except that they are right and left-hand. They are operated as separate units, but can be operated together if necessary. They are of the double acting, tandem 4-cycle type, each having two cylinders 24 ins., diam. by 36 ins.stroke, and rated at 750 h.p. each; giving a total of 1,500 h.p. available. The length of each engine overall is 40 feet. The crank shaft is 18 ins. diameter by 14 ft. long, and carries a 20 ton flywheel. The cam or lay shaft is 4¾ ins., diam., 14 feet long and weighs 1,900 pounds. This shaft runs alongside the engine on the floor and operates the valves located on the underside of the cylinders which are easily accessible from the floor under the engine room. The natural gas which the engines use is piped from Tilbury, Ont., 40 miles distant. Each engine runs at 150 r.p.m., and is direct-connected to a 450 k.v.a. 60-cycle Crocker-Wheeler revolving field 3-phase generator, and excited by a 17 k.w. Crocker-Wheeler belt driven exciter. Each engine has connected to it an air compressor which is driven from the crank shaft. Each compressor is rated at 100 h.p., and will deliver 500 cub. ft. of free air per minute.

Switchboard.

The switchboard is of the automatic type and was supplied by the Canadian General Electric Co. It has panels made of natural black slate and is mounted on iron pipe framework with a full complement of instruments which have a dull black finish. The switchboard controls are as follows: — 2-480 volt, 500 k.w. 3-phase, 60-cycle engine driven generators; 2-110 volt, 17 k.w. exciters; 1-35 k.w. 110 volts, exciter direct connected to a 50 h.p. motor; 3-180 feeders; 1-100 k.w. 3-phase transformer; 3-35 k.w. single phase, 3 wire lighting feeders.

The apparatus controlling the above is mounted on a bench board to be seen in the illustration. The bench board is fitted with a number of switches and illuminated indicators. A 20-ton hand-operated overhead Niles travelling crane is installed and mercury vapor lamps are used for lighting.

It will be interesting to note that there is operating at the Detroit factory a 5,000 H.P. gas engine made by the same firm as the one described above. This unit is perhaps one of the largest gas engines installed in a factory on this continent.

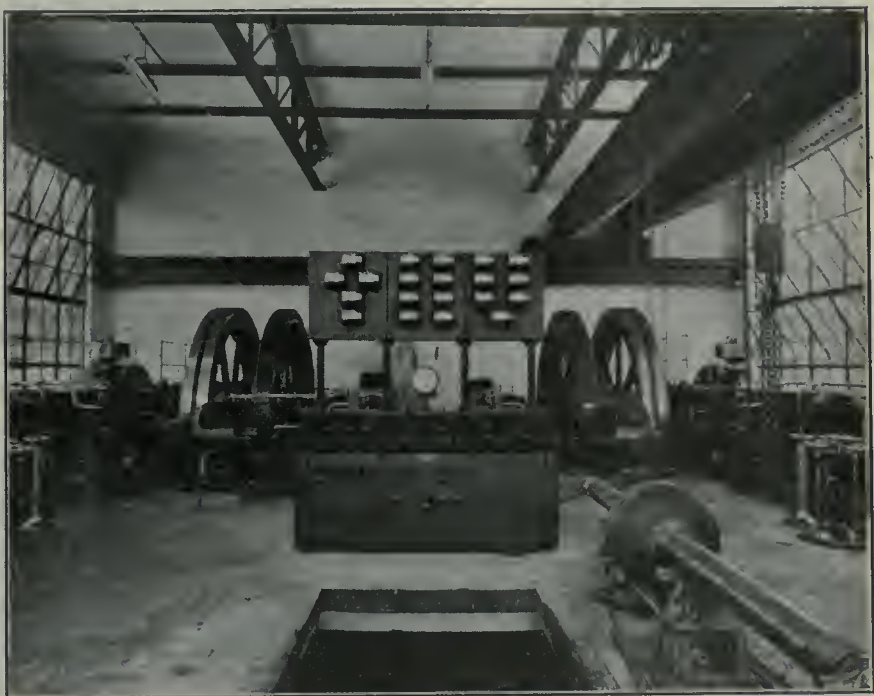
Boiler Room.

The boiler room is located near the power house and is connected to it by an underground passage terminating in the basement. The building is of substantial brick construction, 90x80 ft., and has steel roof trusses with concrete roof. The windows are fitted with "Kahn" steel sash and ribbed glass; a number being made to open, permitting of ample ventilation.

There are installed four Goldie & McCulloch horizontal return tubular boilers of 90 h.p. each, 60 in. diameter by 16 ft. long. The boilers are capable of carrying 140 lbs. steam pressure, but at present are running at 90 pounds. Each boiler is equipped with a set of burners for using natural gas as 11 ozs. pressure. Near the boilers is a Goldie & McCulloch No. 4 "Ideal" feed water heater rated at 125 h.p. and, in connection with it, a duplex boiler feed pump, 5½x3½x6 ins. for boiler feeding. A "Burnham" vacuum pump 16x18 ins. takes the drains from the heating system and returns them to the heater.

In the basement, under one end of the boiler room, are two 6-in. steam turbine double suction centrifugal pumps for pumping hot water from the boilers to the heating coils on the roof of the main factory building. Each pump has a capacity of 1,000 gallons per minute against a head of 50 ft. at 2,500 r.p.m., and is direct · connected to a No. 5 Buffalo Forge Co. "Spiro" steam turbine, developing 22 h.p. at 90 lbs. steam pressure, non-condensing. Adjoining these sets is a 1,000 gallon Worthington duplex steam pump for supplying water to the two tanks over the main factory building.

In the boiler room is installed a steam-driven air compressor supplied by the Bury Compressor Co., Erie, Pa. This machine has cylinders 12x12x12 ins. stroke with a capacity of 310 cu. ft. of free air per minute against a pressure of 100 pounds at 200 r.p.m. Under these conditions it is rated at 62 h.p. It is fitted with cushioned poppet inlet and discharge valves, and has forced feed lubrication. All the high pressure steam pipes are fitted with crane extra heavy fittings, and Philip Carey Co. pipe covering is used throughout the plant.



INTERIOR OF POWER HOUSE.

General Features.

The office building is bright and well furnished, and from it can be obtained a fine view of the Detroit River. The general organization and manufacturing methods are modelled after those in force at the Detroit factory whose engineers have always been available for advice and assistance when necessary. Automobiles are shipped from Ford to all parts of the British Empire, and we understand that the demand is increasing rapidly each year. An interesting periodical, the "Ford Times," is published monthly. It is worthy of note that the capital stock of the company is largely

Canadian, and that local labor is employed as much as possible. About 1,500 employees are on the pay-rolls at the present time.

The officers of the company are Henry Ford, president, James Couzens, vice-president; G. M. McGregor, secretary-treasurer and general manager; and W. R. Campbell, assistant manager.

A CANADIAN TOOL STEEL PLANT.

IN the large new tool steel and twist drill plant of Armstrong, Whitworth of Canada, Ltd., now nearing completion at Longueuil, Que., an important addition has been made to Canada's manufacturing facilities in the metal trades. The new plant, which is large enough to supply a large proportion of Canada's high speed crucible steel requirements, is thoroughly modern. The parent English firm of Sir W. G. Armstrong, Whitworth & Company, Ltd., with its several huge plants, is one of the oldest and largest manufacturers of crucible tool steel in the world. The new Canadian plant profits from this experience, commencing its operation with all advantages of equipment and processes that have been found desirable by the older Company. It will manufacture high grade tool steel, including the celebrated "A.W", "T.Y.R" and "A.W.Premier" brands, drills, reamers, cutters, taps and dies, machine tools, cranes, forgings, lock and dock gates, etc. With complete equipment for the manufacture of these standard lines, and also of special steels where required, and with production capacity large enough to supply all reasonable requirements, the new plant will supply a real need in the Canadian metal trades. It is the Company's intention to carry a complete and ample stock of standard lines, so as to insure quick deliveries.

The plant itself embodies the most modern ideas, in layout, construction and equipment. The illustrations give a partial view of the main building, which is located near the main line of the Quebec, Montreal & Southern Railway. There are seven separate buildings—all under one roof, and connected by an alley-way. One end and both sides are permanent in construction, but the other end is only a shell of timber and plaster. Thus all seven buildings may easily be extended when future requirements demand. The departments are:—(1) Raw materials, (2) Crucible factory, (3) Crucible castings department, (4) Steel foundry, (5) Steel foundry, (6) Rolling mill department, (7) Hammer department, (8) Tool steel warehouse, (9) Hardening department, (10) Small tool shop. Material passes through departments in the order named to the hammer department. After annealing, bars are ready for shipping in that state or for further manufacture into drills, taps, reamers, milling cutters, etc.

Excellent daylight is provided by windows that occupy fully 60 per cent. of the wall area and also by the eighteen skylights—Artificial light is supplied by flaming arc lamps and tungsten lamps. Heating throughout the plant is accomplished by the vacuum steam system which utilizes the 400 h.p. of exhaust steam that would otherwise be wasted.

Electric overhead traveling cranes, manufactured by the Whiting Foundry Equipment Co., serve each department, except the small tool shop. The steel foundry crane is of 15 tons capacity, but 5-ton cranes are sufficient equipment for the other departments. Steam hammer equipment includes hammers ranging from three tons to four hundred-weight.

There is a wide range of size and capacity in the battery of furnaces, including small tempering furnace, mufflers, hammer forgings and annealing furnaces, reheating furnaces, and on up to the large crucible furnaces.

The boiler and gas houses are entirely separate from the main buildings and each is laid out with a view to future extension at the lowest cost and least inconvenience. A battery of 1,000 h.p. Babcock & Wilcox boilers is the present installation. The chimney is 150 ft. high and is capable of handling double the present boiler equipment.

As a whole, the plant is laid out and equipped according to the best modern practice.

PLANT OF ARMSTRONG, WHITWORTH OF CANADA, LTD., UNDER CONSTRUCTION.

NEW C.N.R. PLANS.

THE Canadian Northern Montreal Tunnel & Terminal Co., Ltd., have filed plans with the Railway Commission for a revised location of its tunnel line from the water front to the point of junction with the main line.

The previous location had been approved by the Commission after several hearings held in Montreal, but it has become desirable to make one or two changes. One of these, as shown by the revised location, is that they will take only 50 feet of a right-of-way under the mountain instead of 100 feet as first planned. This may lessen the land damages paid to owners under whose property the tunnel will run.

It is not thought the railway board will raise any objection to the revised location, as it does not involve any further damage to property rights, the centre line of the right-of-woy being unchanged along its length.

Mr. S. P. Brown, chief engineer of the Canadian Northern Tunnel, states that no drastic changes in the tunnel are indicated by the plans placed before the Railway Commission. When the original plans were filed they provided for a right-of-way of 100 feet, in order that should the tunnel deviate from the plans the right-of-way would not be exceeded. Now that the tunnel is through, revised plans had been filed, showing the actual tunnel as constructed and having a fifty-foot right-of-way. When the work was finally completed this would probably be reduced still further.

The new plant which the International Malleable Iron Co., Guelph, Ont., have built for the manufacture of malleable iron castings indicates development in what is becoming an increasingly important industry in Canada. Much foresight has been shown in the layout of the plant to secure maximum output.

THE International Malleable Iron Co., Ltd., have built a large foundry at Guelph, Ont., for the manufacture of malleable and grey iron castings, at the eastern end of the city, on a site covering about 12 acres and adjoining the Canadian Pacific Railway tracks. The company is operating under the auspices of the Illinois Malleable Iron Co., of Chicago, Ill., who, in conjunction with W. A. Mahoney, architect, Guelph, were responsible for the lay-out and construction of the plant; they will, therefore, have the benefit of the experience gained in this class of work by the parent company who are one of the largest manufacturers of malleable castings in the United States. The site is level, and being near the railway, every facility is offered for the receiving of the raw materials and the shipment of the product; a siding on the property leads into the stockyard where will be laid an industrial track system, when materials will be conveyed directly into the foundry. The siding also passes along, outside the annealing room where coal is delivered direct from the cars to the annealing oven furnaces, through openings in the wall.

At the present time only malleable iron castings are being produced, but provision has been made for making grey iron castings when the company desire to do so, the main endeavor at the outset being to have the malleable plant completely equipped. Excellent progress has been made in this respect, the latter being practically complete, with the exception of the addition of special machinery, such as the class of work calls for. A modern office building and a machine and pattern shop will be erected in the near future. These departments are occupying temporarily parts of the main building, the offices in the south-west and the machine and pattern shops in the south-east sections. The section where the offices are now located will eventually be used as a pattern storage. A cleaning room will replace the machine shop. As the class of work becomes more definite and therefore standardized, special moulding and other machines will be installed.

Buildings and Lay-out.

The lay-out of the buildings and loca

FOUNDRY INTERIOR, SHOWING MOULDING FLOOR.

tion of the equipment provides for the handling of the raw materials and product as expeditiously as possible with a consequent saving in operating expenses. The system is continuous, from the time the raw materials leave the cars to the arrival of the finished product in the shipping room, one process follows another consecutively; in no case have the castings to be "brought back" for any particular treatment.

The buildings are of substantial brick construction and are light and well ventilated, wood columns and wood roof trusses with steel tie bars being generally used with a 2 in. wood roof covered with roofing material. The columns in the machine shop and annealing room are of steel. The monitor roof in the moulding bay has windows which open all the way along. The contract for the brick work was carried out by Taylor Bros., Guelph, and the wood work by Ibbertson Bros., also of Guelph, the rest of the work being done by the company.

The main building is 470 feet long and 103 ft. wide, and lies east and west. The moulding bay or foundry occupies the larger part of this, being 362 ft. long by 103 ft. wide, while the machine shop at the east end is 108 ft. long and 69 ft. wide, the remaining 34 ft. being occupied by the cleaning room, which is 108 ft. long. At the south side of the cleaning room is the annealing room which is 108 ft. by 121 ft. Returning to the west end of the main building, we have, on the south side, the pattern storage 50 ft. by 20 ft. and core rooms 125 ft. by 50 ft. Adjoining the pattern storage are the offices, and beyond are the lavatories; two buildings, 33 ft. by 24 ft. The power house is 35 ft. by 48 ft., and is situated at the north-west corner of the main building. Between these buildings is the cupola, and a room where the heating apparatus is installed.

Foundry.

The foundry, as has already been stated, is 362 ft. long and 103 ft. wide, and is divided into three bays, the centre being 53 ft. wide and the side bays 25 ft. wide. The centre bay has a monitor roof with windows all the way along, operated from the floor, and a lantern built to allow for the Wickes boiler being enclosed. The side bays are well lighted, windows being placed along the walls except where other buildings prevent this. At the north-west corner is a 54 in. Sheldon cupola for use when the company desire to make grey iron castings. The blast for the cupola is furnished by a Sheldon blower direct connected to a 20 H.P. Canadian Westinghouse motor. The hoist for carrying materials to the charging floor has a capacity of 4,000 lbs., is electrically operated and was supplied by the Otis-Fensom Elevator Co., Hamilton, Ont.

In the centre of the foundry and grouped together, are the air furnace, boiler and stack. Along the walls on each side are the moulding benches for light work, and of which there are about 50, and a number of machines which include 18 air machine squeezers of the company's own design and some hand squeezers supplied by the Adams Co., Dubuqe, Iowa. It is the intention to install a number of special moulding machines later. Compressed air is piped along the walls in 4 in. pipes with 1½ in. connections for each set of two machines. There is a stove for drying ladles which will take care of about 12 at one time.

The core rooms are on the south side of the foundry and connected with it by a passage, a core room being on each side. In one of these, men are employed, and it is the intention to employ girls in the other room. A "Millet" oven has been installed for light cores and also a truck oven 15 ft. by 20 ft., which is large enough to hold four trucks, each of four tiers high. On one side are a number of shelves under which is the fire grate where coke is used for heating the oven. The oven is of the company's design and manufacture.

Air Furnace.

The air furnace is of brick construction and was built to the designs of the Illinois Malleable Iron Co., Chicago. It is rectangular in shape and has a capacity of 15 tons each heat, two heats being drawn each day, morning and afternoon, making a total of 30 tons when operating at full capacity. At the end away from the stack is the fire grate

FOUNDRY INTERIOR SHOWING AIR FURNACE.

where gas coal is used for heating the furnace. The draft is supplied by a Sheldon blower direct connected to a 20 h.p. Canadian Westinghouse motor, which delivers air at a pressure of 3 ozs., under the grate bars through the main vertical duct which is connected to 6 smaller ducts fitted in the furnace above the bridge wall. At this point the pressure is reduced to .75 oz. The gases coming over the bridge from the fire are deflected down and distributed in the furnace by the blast. The opening at the end of the furnace shown in the illustration is the ash pit under the grate bars.

In operation, the furnace is heated up, then charged first with sprue and steel scrap through an opening in the top made by removing one or more bungs. These bungs are iron castings faced with firebrick, and can be seen in the illustration leaning against the furnace. The bungs are handled by means of a runway and hoist seen above the furnace. The pig iron is next fed through a door at the side, the same door being also used for skimming the metal, skimming taking place twice during each heat. When the metal is ready to be tapped, the men line up on both sides of the furnace, there being a tapping hole on each side, some with 50 lb. ladles and two men handling the larger or bull ladles holding about 100 lbs. The metal is carried to the various molds in the small ladles for bench work, and in the large ladles for floor work.

Boiler.

A waste heat boiler has been installed in connection with the air furnace in order to utilize the large amount of heat in the gases leaving the furnace. The boiler is a 400 horse-power vertical water tube unit, built and installed by the Wickes Boiler Co., Saginaw, Mich. The design is especially adapted to its particular purposes, as the floor space required for the boiler and auxiliary furnace is a minimum. Another advantage that tends toward the greatest absorption of heat is the long travel of the gases in close confinement to the heating surface.

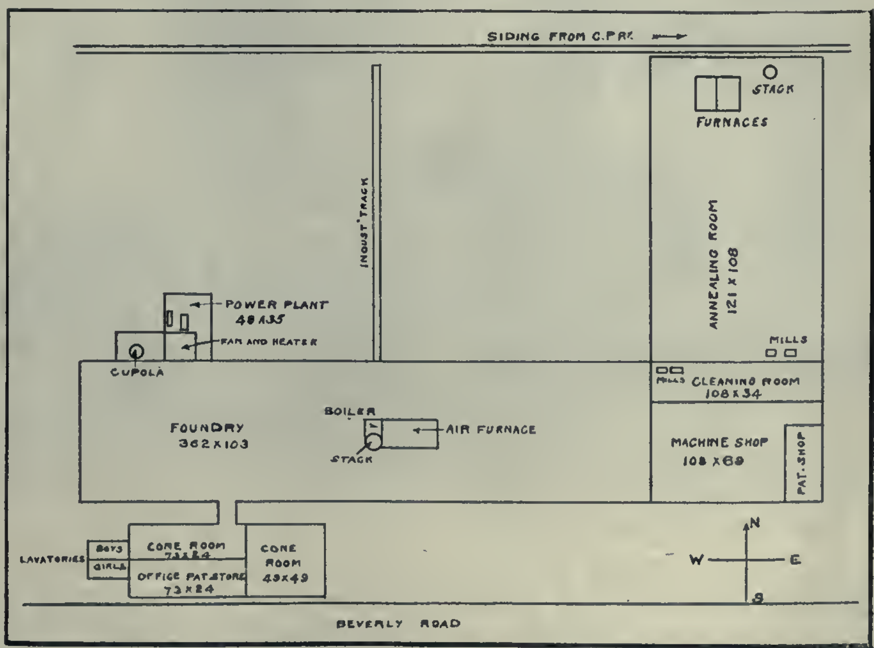
Fire brick dampers are installed at suitable locations to permit the use of the boiler as a direct fired unit in case the steam is desired when the air furnace is down. The auxiliary furnace is hand fired, and will be used to obtain the desired output from the boiler during the charging periods in addition. A waste heat by-pass flue around the boiler to the stack has been provided so that should anything happen to the boiler or boiler setting, it would be possible to take off the heat without damage to the furnace. The total floor space required for the flues, boiler, auxiliary furnace and stack is approximately 25 ft. square. The stack, of perforated radial blocks, is 110 ft. high above top of foundation, and was built by the Alphons Custodis Co., New York. It is 3 ft. 6 ins. diameter at the top, and the foundation of concrete is 15 ft. square by 5 ft. deep. All round column construction is the particular type, and a sectional fire brick lining, 4 in. thick, supported every 20 ft. on the inside by fire brick corbels built out from the main walls, extends throughout the whole height.

The stack is built for high temperatures, the inner core being not only of firebrick, but in addition having the main walls reinforced by internal steel bands built at intervals into the masonry. Between the lining and the main walls there is a 2 in. air space, and each section of lining is built free at the top to allow for expansion under high temperatures. The particular feature of construction is that all the blocks are cut on radial lines to fit the diameter. They are also perforated vertically, the mortar in the horizontal joints entering the holes, keying the blocks, as it were, together. The material is manufactured exclusively for chimney blocks, and has a crushing strength averaging over 6,000 lbs. per square inch.

Cleaning and Annealing.

When the castings have cooled off, they are taken from the flasks and wheeled to the cleaning room, where they are first put in the hard tumbling mills for a preliminary cleaning. There are four hard mills of the Company's own design, each being 2 ft. 6 in. diameter by 5 ft. long, and the battery is driven by a 15 h.p. Canadian Westinghouse motor. After being removed from the mill, the castings are taken to the cleaning benches, where the gates, etc., are broken off, and then sorted and weighed on a Fairbanks scale located at the door of the annealing room. The weight of each batch is noted by the operator at the scales, also the number and name of moulder, shop number of the job, order number, kind of work, number of pieces in batch. These particulars are entered on a sheet, which, together with the foundry foreman's records, form a system of checking the work for the pay rolls, etc.

After being weighed, the castings are wheeled to the annealing room, where they are packed in pots with mill scale, which is a form of oxide of iron. The pots are made of iron, open at the sides, and are put into the annealing oven by a charging machine. Each oven will hold 46 pots, four high. They remain there about seven days, during which time the heat is gradually brought up to the desired temperature, then cooled down.



PLANT LAYOUT, THE INTERNATIONAL MALLEABLE IRON CO.

When the castings have been annealed, they are taken to the soft tumbling mills for final cleaning. There are four soft mills also made from the Company's own design, each mill being 2 ft. 6 in. diameter by 5 ft. long, and driven by a 15 h.p. Canadian Westinghouse motor. Castings that are too light to be tumbled are cleaned by a pickling process. When taken from the mill, the castings are wheeled to the shipping room on one side of the annealing room, and sorted and bagged ready for shipment.

Annealing Ovens.

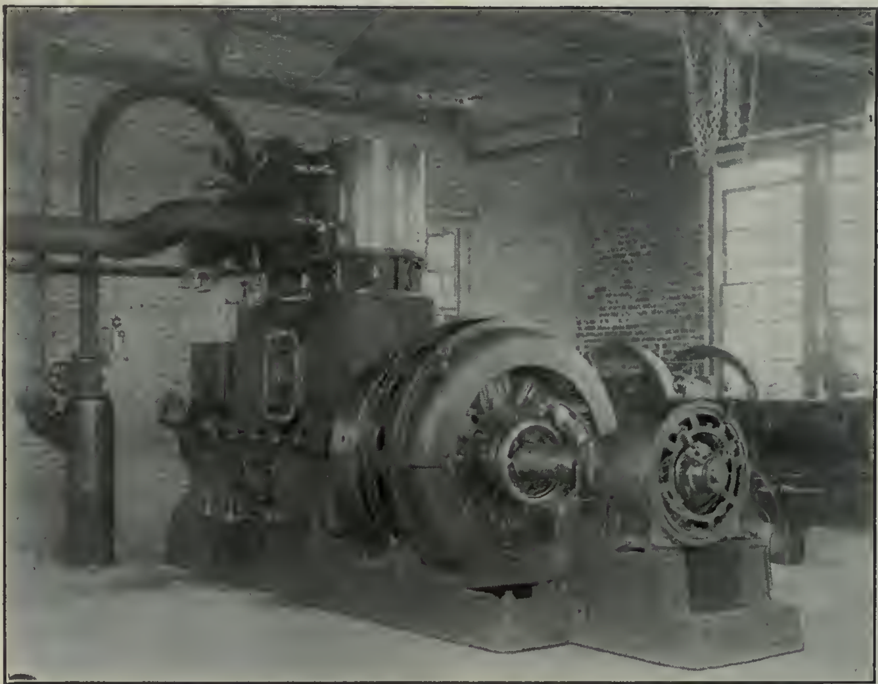
There are two annealing ovens made entirely of brick and well stayed. They were built from designs furnished by the Illinois Malleable Iron Co., and have each a capacity of 25 to 30 tons. It is intended to build another annealing oven alongside the present set. The front of each oven is bricked up after being charged. At the rear end are the fires which use gas coal. The gases pass from the fire, and are then deflected upwards by a brick wall, passing along over the pots to the front end, where they are drawn down through the flues and back under the furnace floor to the stack. The latter, of brick, is 90 feet high, and was also built by the Alphons Custodis Co., New York. For taking the temperature of the ovens a "Pycos" pyrometer is used; it can be switched to either oven. The pyrometer was supplied by the Taylor Instrument Co., Rochester, N.Y. A railway siding runs along outside, and coal is fed into the annealing room through openings in the wall.

Machine and Pattern Shops.

The machine shop is situated at the eastern end of the main building, part of which is used as a pattern shop, the latter being 40 feet x 20 feet. At the opposite end is a store room for shop stores. In the pattern shop are a number of machines, the principal being a Thomas core-box machine by the Portland Co., Portland, Me.; an Oliver No. 3 wood trimmer and a 38 in. band saw by the F. H. Clement Co., Rochester, N.Y. The machines in this department are driven by a 20 h.p. Canadian General Electric motor.

The tools in the machine shop are for plant equipment, repair purposes for the most part. Several special machines have, however, been installed for threading malleable elbows, tees, unions, etc. These latter are not in operation at present, but will be when this line of product has been fully developed.

The principal machines include a 12 in. drill by the Hamilton Tool Co., Hamilton, Ont.; a power press by Brown, Boggs Co., Hamilton, Ont.; a Windsor Machine Co. 10 in. turret lathe; a power hack saw by D. MacKenzie, Guleph; a "Landis" bolt threading machine, 13 in. and 9 in. lathes by the American Tool Works Co., Cincinnati; a Brown & Sharpe universal milling machine, a similar tool by the Canadian Machinery Corporation, Galt., Ont. Special machines include a Warner & Swasey turret lathe converted into a union machine; a special union machine supplied by the Illinois Malleable Iron Co., and four tapping machines by the Williams White Co., Moline, Ill. These machines are specially designed for tapping malleable iron elbows and tees. The main line shaft is driven by a 30 h.p. Can. Westinghouse induction motor.



"LEONARD" ENGINE AND GENERATOR WITH "BURY" COMPRESSOR.

Power Plant.

The power house contains a "Leonard" high speed engine, rated at 300 i.h.p., running 375 r.p.m., with steam pressure of 125 pounds. It is of the vertical compound type, with cylinders 15 and 20 in. diameter by 10 in. stroke. The engine is totally enclosed, and is equipped with oil relay expansion gear operating the high pressure valve and regulating the cut off in accordance with the engine load. The engine is direct connected to a 150 k.v.a. Canadian Westinghouse generator supplying current at 600 volts, 3-phase, 25 cycles. The 6 k.w. exciter is on the main shaft. The switchboard was supplied by the Canadian Westinghouse Co., and has two slate panels equipped with 3 ammeters, a voltmeter, and the necessary switches.

The air compressor was supplied by the Bury Compressor Co., Erie, Pa., and is of the horizontal simple steam driven type, with cylinders 12 and 12 diameter by 14 in. stroke. Its capacity is 330 cubic feet of free air per minute at 180 r.p.m., against a pressure of 100 pounds, and under these conditions approximately 66 h.p. can be developed. The steam and air cylinders are in a straight line, and have a common piston rod. The compressor has an enclosed crank case, and is fitted with the "Bury" automatic, pneumatic forced lubrication system, designed to increase the efficiency of the machine, and to reduce loss of oil to a minimum. The air inlet and discharge valves are of the cushioned poppet type, rendering the compressor noiseless in operation. The air receiver is 48 in. diameter by 12 feet long, and is situated in the foundry.

An "Ideal" feed water heater and purifier is installed, and was supplied by the Goldie & McCulloch Co., Galt. It is an open type heater, 5 ft. diameter by 14 ft. high, and is fed with city water by gravity and heated by exhaust steam from the engine. Feed water is pumped to the boilers by two 7½-4½-10 in. duplex pumps, which were supplied by the Canadian Allis-Chalmers Co. The steam pipes and fittings are extra heavy quality, and were supplied by the Crane Co., Chicago. They are covered with Johns-Manville Co. asbestos pipe covering. A hand travelling crane is installed and equipped with a 2 ton chain block.

Heating System.

The heating system was installed by the New York Blower Co., Chicago, and consists of a 200 in. steel plate motor driven fan, standard for 60,000 cu. ft. of air per minute, together with a heating coil of sufficient capacity to heat the above quantity of air to around 120 deg. through 12,000 lineal feet of 1 in. pipe arranged in two groups. The heating coil is raised to a sufficient height so that the water drains back to the feed water heater. The apparatus is designed for using exhaust steam from the main engine and steam supplied direct from the boiler through a pressure reducing valve. The apparatus operates on low pressure steam at all times.

The buildings heated consist of the main foundry, cleaning room, machine shop, pattern shop, and core rooms. The warm air is distributed through galvanized iron ducts running the whole length of the foundry, with branches leading off at various points for distribution. The fan is located in a separate room near the power house.

General Features.

The entire plant is lighted by tungsten lamps, those in the foundry and machine shop being 100 watt and in the annealing and core rooms 250 watt, 110 volts, while current is distributed to the motors at 550 volts, 25 cycle, 3 phase.

The officers of the company are: H. E. Bullock, President; P. D. Ivey, Vice-President; C. H. Ivey, Secretary, and W. H. Burgess, General Superintendent.

PROGRESS ON THE QUEBEC BRIDGE, 1913.

THE close of the year 1913 sees the work of constructing the huge 1,800 ft. cantilever bridge across the St. Lawrence River above Quebec well under way. In point of length it will rank as the longest span in existence, and in point of weight will also take a place as one of the world's largest bridges. The new Hell Gate bridge over the East River at New York, for the New York Connecting Railroad, is the only structure in progress or contemplation which exceeds the Quebec Bridge for weight of steel involved.

The construction of both main and anchor piers of the Quebec Bridge has now been completed on both sides of the river. These occupy the same centre line as the original bridge which collapsed in 1907, but are all farther to the south. The old piers have been removed down to two feet below low water mark, so as to cause no disfigurement to the view. Both main piers were constructed with caissons under pneumatic pressure and extend down to bed rock. The anchor piers on shore are above high water mark, and also extend down to bed rock. The whole of the sub-structure work has been carried out by the well-known firm of M. P. & J. T. Davis.

The contractors for the superstructure are the St. Lawrence Bridge Co., Ltd., Montreal, who have erected a large plant at Rockfield, Que., a few miles west of Montreal. This plant was described in the issue of "Canadian Machinery" for May 22 last. It has been designed primarily for the economical handling of this particular contract. The company have built at the bridge site, on the north shore, a completely equipped camp to accomodate about four hundred men, which is about the largest staff that will be employed on the actual erection work. The camp has the usual dining hall, kitchen, bunk houses, hospital and other buildings; but is unusually well built and furnished, having even a special water service and sewerage system. This is made the more necessary by the fact that it will be in practically constant use for a period of five years. instead of for one season only.

Close to the north abutment of the bridge a power plant has been installed furnishing air and electric current for the work. Power is purchased from the Quebec Railway Light, Heat and Power Company at 22,000 volts, three-phase, 60 cycles. The plant contains at present two Ingersoll-Rand 16 in. x. 10 in. x 14 in. compressors, belt driven by 100 h.p. induction motors. Space has been provided for two additional machines. Since all the motors used on the work will use direct current at 230 volts, two 250 k.w. 250-volt D. C. generators direct driven by two k.v.a. 2,200-volt synchronous motors are already in place. Later on a similar plant, except that the primary voltage is 11,000, will be put in on the south side of the river. This is not required at present, as construction is being commenced on the north shore first.

On this shore all the approach spans have been erected by means of a derrick car. They consist of two single track bridges side by side, each containing one span of 110 ft. 7½ in., and one of 157 ft. 10½ in. Work is now in progress on the erection traveller for handling the main spans. This machine is in itself a large contract, as it weighs about 920 tons in working order, and stands 205 feet high above the rails on which it runs. An illustration is shown of this traveller in course of erection on the north shore.

In the erection of the anchor arms steel falsework will be used exclusively. Two separate systems are required, one carrying the floor system and erection traveller, and the other the main trusses of the anchor arm. Most of the material for this falsework is already stored at the bridge site, ready for the opening of the season of 1914.

Over 6,000 tons of finished material for the bridge is now in storage on both sides of the river. This consists principally of track girders, track stringers, floor beams, sub-floor beams and floor bracing. The first of the enormous main shoes is now practically finished at the shops, and the second is well advanced. The construction of the bottom chord members and bottom lateral bracing is also under way. More than 1,500 tons of erection material have been fabricated and shipped from Rockfield, wholly for use on the north for the present. It is expected that a part at least of the steel falsework can be used again on the south shore, although the erection traveller will be duplicated on that side.

The concrete footings for the falsework posts have been finished on the north shore; so that as soon as the ice goes out in the spring of 1914 the traveller can commence the erection of the steel for staging. It is hoped to erect the north anchor arm complete during 1914, with the possible exception of the main post.

NEW C.P.R. ELEVATOR AT WEST ST. JOHN, N.B.

A NEW grain elevator which embodies the latest ideas in elevator design has recently been completed at West St. John, N.B., for the Canadian Pacific Railway, and received its first consignment of grain at the beginning of December. It has a capacity of 1,000,000 bushels, and was designed and constructed by the John S. Metcalf Co., Ltd., Montreal, the work having been carried out under the direction of J. M. R. Fairbairn, assistant chief engineer, C.P.R.

The elevator and the tracks serving it stand upon new ground, which was formerly beach. As the tide at St. John has a maximum rise and fall of 28 feet, the work of putting in the foundations was a matter of some difficulty, as the foundations extend for the most part below low water mark and the work was done before the earth fill was made. The building is 195 feet long, 93 feet wide and 202 feet high above track level, the foundations going 30 feet lower. The bins are of reinforced concrete on concrete columns, the latter resting on concrete piers going down to the rock. They are circular in form and 84 feet deep, the walls being 7 inches thick. The total number of bins is 171. Ten of the bins are used as shipping bins, with a capacity of 12,000 bushels each. The five-storey cupola is of structural steel covered in with corrugated galvanized sheeting, the floors and roof being of concrete. There are eight elevator legs, each with a capacity of 12,000 bushels per hour. From the garners the grain passes to eight Fairbanks 2,000 bushel hopper scales, which deliver to sixteen Mayo distributing spouts with a radius of 25 feet. The scales also distribute to two 36-inch transfer belts, which run the full length of the house, and can deliver to any of the Mayo spouts.

There are four receiving tracks running through the house, cars being handled on any of these by an electric car puller. The receiving capacity is 160 cars per ten hours, the grain being discharged into the 16 receiving hoppers by mechanical unloaders. The shipping capacity is 30,000 bushels per hour to steamships, the grain being carried to the wharves by two 36-inch belts in a conveyor gallery, which also connects with the C.P.R. No. 1 elevator. Provision has been made for doubling the shipping capacity when required.

All machinery is driven by induction motors, each unit having an individual drive. Current is supplied from a power house adjacent to the elevator. This contains two turbo-generator sets of 500 k.w. capacity each. Three-phase current at 550 volts, 60 cycles, is delivered by the generators, which were made by the Canadian General Electric Company. The turbines are by the Allis-Chalmers Co., Milwaukee. The condensing apparatus is of Worthington make, and was supplied by the John McDougall Caledonian Iron Works, Montreal. The condenser is of the counter-current barometric type, with a motor driven centrifugal circulating pump and a steam driven vacuum pump.

Steam is raised in four return tubular boilers built by the Jenckes Machine Co., Ltd., the working pressure being 150 lbs. per square inch.

All the elevating and conveying machinery was supplied by the Dodge Mfg. Co., Toronto, and the Canadian General Electric Company supplied all the motors, the wiring for these and the lighting having been done by W. J. O'Leary & Co., Montreal. The Dominion Bridge Co., Montreal, supplied the structural steel work, while the corrugated covering was done by the Montreal branch of the Metal Shingle and Siding Co., Ltd.

DOMINION BRIDGE COMPANY IN 1913.

THE Dominion Bridge Co., Ltd., Montreal, have had a very successful year during 1913. The annual report submitted to the shareholders on December 17 showed net profits, after allowance for bad and doubtful debts, for depreciation of plants and buildings to the amount of $832,778, or equal to 12.8 per cent. on the Company's $6,500,000 stock. There is no bonded indebtedness and all securities are in one class of stock.

The profits were appropriated as follows: $5,750 in bonuses voted by shareholders, $565,699 in dividends, $153,053 was added to reserves and $15,714 written off organization expenses, while $92,561 was carried forward to profit and loss, bringing that account up to $409,276, against $316,715 the previous year. Reserve accounts have been increased from $619,393 to $756,870.

Mr. Phelps Johnson, President of the Company, in his report to shareholders, stated that the output of the various plants had been 76,073 tons, an increase of 13,026 tons over the previous year, and that the increase would have been considerably larger but for the congested condition of all steel mills during the early portion of the year. Had the supply of steel been available as promptly in the early part of the year as towards the end the total output of Dominion Bridge would have been in the neighborhood of 90,000 tons.

"Business entered during the past year," said Mr. Johnston, "totalled approximately $6,500,000, and the gross value of the contracts charged up as fully completed and considered in the profit and loss statement for the past year is $5,621,010, while work to the approximate value of $8.650,000 is being carried forward into the new year, on which expenditures amounting to $5,446,471 have been made."

Owing to the unsettled condition of the steel market, it had been deemed wise to write down the value of all stock material on hand to a very conservative figure. Important extensions had been carried out at the Lachine, Winnipeg, Toronto and Ottawa plants, which placed the Company in a comfortable position to handle new business.

Outlook for Next Year.

Dealing with the general outlook, Mr. Johnson stated: "The business outlook for the current year, while not as bright as it was twelve months ago, is still far from discouraging and with the large volume of unfilled orders carried forward, the majority of which are entered at profitable prices, your directors look forward with confidence to a continuance of the favorable results now shown."

The balance sheet of the Company shows a favorable position, current assets being $1,857,818 in excess of current liabilities. This is the first annual report to be made public. Within the year current liabilities have increased by $1,179,315, but against this has been an increase of $1,358,917 in current assets. Fixed assets, including investments, have increased by over $1,300,000.

THE MORRIS OVERHEAD RUNWAY.

THE extension of engineering methods to general industries is perhaps one of the most significant signs of the times, and a striking example of this trend is given in the accompanying illustration, which represents the interior of the new warehouse of the Calgary Paint and Glass Co. The Morris overhead runway, which was originally designed by Herbert Morris for the transportation of heavy castings and other materials in the machine shop, is here used for conveying large cases of glass, and it is to be noted that the selective feature of this runway permits of a case being picked up in any bay and transferred to the wagon at one handling.

THE MORRIS OVERHEAD RUNWAY.

Another novel feature, adopted from foundry practice, is the construction of the travelling chain block, which is arranged to lower the load by gravity at a rate of 30 feet a minute. This high speed is obtained without risk to the glass or to the operator by fitting to the gearing two automatic brakes, either one of which is powerful enough to hold the full load.

This interesting picture is reproduced by the courtesy of the Herbert Morris Crane and Hoist Co., Ltd.

"The Departmental House for Mechanical Goods" is the slogan that reflects the policy of the Canadian Fairbanks-Morse Company, Limited, whose wonderful growth during the past sixteen years is proof of what can be done by sound business methods, combined with a determination to give the customer an absolutely square deal.

FROM a small Canadian branch established in 1898 for the sale of Fairbanks' Scales and other goods manufactured or handled by Fairbanks & Co., New York, there has grown up the present Canadian Fairbanks-Morse Company, whose present operations cover the whole Dominion. The Company has eight branches and seven sub-offices, extending from the Atlantic to the Pacific and does an enormous business, the yearly turnover now amounting to between five and six millions of dollars.

To build up this large business has taken unusual energy, initiative and ability, and to Mr. Henry J. Fuller, the President of the Company, belongs a very large share of the credit for the strong position held to-day by the Canadian Fairbanks-Morse Company. Mr. Fuller came to Montreal from New York in February 1898, as representative of The Fairbanks Co., to look over the field and judge of the possibilities for their business in Canada. His firm were not at all sanguine regarding the Canadian field, and a number of years before had closed their Montreal agency on account of the seeming impossibility of competing in face of the Canadian tariff. Upon investigation, however. there seemed to Mr. Fuller to be a large opening for Fairbanks' goods, provided customers could be supplied from stock in Canada. Ultimately he hoped to establish Canadian factories for the manufacture of these goods.

The result of his recommendation was the establishment of a branch at Montreal under his management. Three years later the business had increased to such an extent that branches were opened in Winnipeg and Vancouver. and later in Toronto. In 1905 it was felt that the time had arrived for the firm to manufacture in Canada and become a Canadian concern in fact as well as in name. A large factory was accordingly erected at Toronto for the manufacture of gas engines, steam pumps, tractors and transmission appliances.

The company also control the output of E. & T. Fairbanks & Co., Sherbrooke, Que., makers of the well known Fairbanks scales and Fairbanks valves. They also control the Dominion Safe and Vault Co., Ltd., Farnham, Que., where are made the Fairbanks wood split pulleys, Dominion safes and vaults, and the Midget flour mills.

Departmental Marketing Methods, etc.

The marketing of one article is a comparatively simple matter; but as the

HENRY J. FULLER.

number and variety of the lines to be sold increase, the complexity of the merchandising problem increases rapidly. With a view to giving Canadian users of machinery and all classes of mechanical goods the benefits enjoyed by the general public when shopping in the large departmental stores, the company has organized its business along departmental lines, with experts at the head of the various departments. The latter number twelve, as follows:—Scales, Engines, Valves and Steam Goods, Pumps, Electrical Goods, Transmission Equipment, Railway and Contractors' Supplies, Small Tools, Safes and Typewriters, Motor Trucks, Machine Tools and Automobile Supplies.

From the large number of lines that are grouped together under these departments, it will be seen that the Company are in a position to fully equip practically any kind of an industrial plant, and that their claim to have departmentalized a great business is set upon a very solid basis of fact. The huge departmental stores which are now to be found throughout the country are the result of an experience which has proved that the bringing together of a large number of lines and classifying them according to departments. makes for increased efficiency and economy, together with improved service, in the merchandising of the goods; and this applies equally well to mechanical goods as to any other line.

New Headquarters Building.

For some time the Company's old headquarters at 444 St. James Street, Montreal, had proved inadequate for conveniently handling the ever-increasing volume of business, and in the summer of 1913 the erection was commenced of a very fine new headquarters depot. This has recently been completed and is said to be one of the most up-to-date of its kind in Canada. It is situated at the corner of St. Antoine and Ste. Cecile Streets, and has a frontage of 94 feet on the former and 144 feet on the latter. It is an extremely handsome building of seven storeys and basement, and has a reinforced concrete frame with brick curtain walls. The front of the building on St. Antoine Street is handsomely finished up to the second floor windows in white glazed terra cotta with ornaments at the head of the pilasters. Two high-speed freight elevators and a passenger elevator have been installed by the Otis-Fenson Elevator Co., while reading and writing rooms for the use of customers are provided, as well as lavatories, locker rooms, etc., for the office staff, which numbers considerably more than one hundred people.

The ground and first floors are used as combined offices and sample rooms, and for retail sales, the idea being to have the goods pertaining to each department in close proximity for the convenience of customers. The third floor is occupied by the head office staff, advertising and purchasing departments, while the fourth, fifth and sixth floors are used for the storage of goods, the top flood being equipped for a repair shop.

With this arrangement the necessity for having a separate warehouse for storing goods is done away with and practically the complete Montreal House business of the Company is carried on under one roof.

The shipping is done from the basement floor at the rear, which is below the level of St. Antoine Street, and provision has been made for a 5-ton motor truck to enter the basement. The front of the basement has been set aside for a demonstration room, with windows so that people on St. Antoine Street can look in. It is proposed to show here gasoline engines, pumps, etc., in operation.

There are from twelve to fifteen separate telephone lines, in and out of the building, with two switchboard operators and an internal telephone system as well.

In a lane at the rear of the building there is a Fairbanks motor truck scale set in a specially deep pit. This pit is connected by a passage and a short iron staircase, with the interior of the building. Visitors can thus inspect the mechanism of the scale in actual operation.

In front of the building on St. Antoine Street is a curb box for free distribution of compresed air for automobile tires. The box is fitted with a lock, a key for which is presented to any automobile owner wishing for one. Inside the box is a small valve and a pressure gauge. By means of the former any desired pressure may be obtained. The air supply is maintained by an automatically controlled Gould compressor driven by a Fairbanks-Morse motor. This compressor set is located just inside the building in the demonstration room in basement. In the basement also, a number of Bowser self-measuring tanks are installed for the storage of gasoline.

The building was erected by E. G. M. Cape, Montreal, and the architects were T. Pringle & Son, Ltd., Montreal, who are to be congratulated on the excellent manner in which they have designed and engineered the structure.

Vancouver Warehouse and Office Building.

The Canadian Fairbanks-Morse Company also erected a new warehouse and office structure in Vancouver during 1913. This is a slow-burning mill construction building covering an area of 20,300 square feet. The site is at the corner of Robson and Beatty Streets, at the west end of the Connaught Bridge. The exterior finish of the building is of pressed brick, with stone trimmings. Extending the full length of the Beatty and Robson Street frontages are large plate glass windows arranged for the display of machinery and mechanical goods. The trackage facilities extend the entire length of the back of the building, giving accommodation for the loading and unloading of six cars.

Between the building and the track there is a 22 ft, unloading platform extending the entire length of the building, this platform being on the same level as the basement floor and the car floor.

Every modern convenience has been installed for facilitating the handling of heavy machinery and mechanical goods, there being an electric travelling crane, with a lifting capacity of four tons, extending out through the receiving and shipping entrances of the building to the tracks, so that goods may be picked up at the car door, carried into the warehouse and deposited at any point on the basement floor, or on the main elevator.

The elevator at the receiving end of the building has a platform 8 ft. x 20 ft. with a lifting capacity of seven tons, and the electric travelling crane is arranged to serve this elevator, thereby eliminating handling heavy machinery and goods by hand. The shipping end of the building is equipped with an elevator having a platform 8 ft. x 8 ft. and a carrying capacity of three tons.

A well equipped machine shop occupies a space on the basement floor 80 ft. long and 45 ft. wide, and the equipment in this shop consists of modern machine tools, 3 motor-driven pipe-cutting and threading machines, and test stand for testing gas and oil engines, the test stand being sufficiently large to accommodate five engines at one time. The steam heating plant is also located in the basement, and is fitted for burning oil. In addition to the regular heating plant there is a garbage burner and heater for supplying hot water throughout the building. The machinery dis-

CANADIAN FAIRBANKS-MORSE CO. HEADQUARTERS BUILDING, MONTREAL.

play and city sales department are located on the ground floor, and the same conveniences have been installed for handling the heavy machinery on this floor as in the basement, viz., an electric travelling crane serving all sections of the display floors. Particular attention has been given to the general appearance of this display floor. Instead of the usual rough finish generally seen in warehouses, the ceiling and walls are plastered, the columns cased and panelled with British Columbia fir veneer to a height of 6 ft. The offices are located on the floor above the ground floor, occupying a space running along the entire front of the Beatty and Robson Street sides, giving an office floor space 30 ft. wide x 300 ft. in length.

The plans for this building were prepared by Parr, MacKenzie & Day, Vancouver.

TORONTO PLANT.

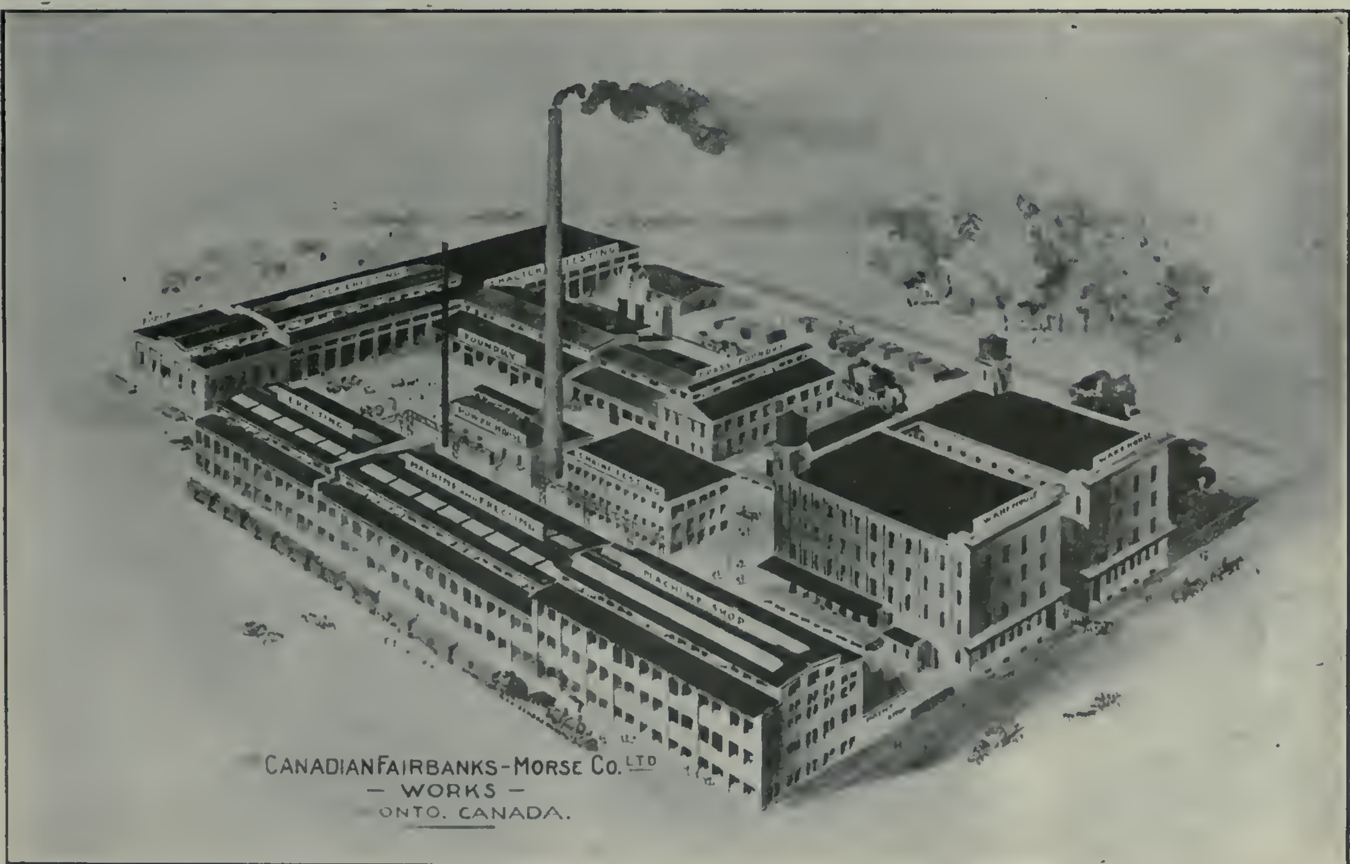
THE Toronto plant, as previously mentioned, was built in 1905, and consisted of a large machine shop, power house and grey iron foundry. All these buildings are of reinforced concrete construction, with concrete columns and roofs. In 1909 a large warehouse building was erected, and in 1912 an extension was made to the foundry, a cleaning room and pattern shop being built and the tractor shop erected. The plant covers an area of 8 acres, and is very conveniently laid out for the expeditious production of the various lines manufactured. These include gas and oil engines for general purposes, marine oil engines, steam pumps, transmission appliances and oil tractors.

ing laid through each shop and interconnecting. For the conveyance of materials on this system trucks driven by Canadian Fairbanks oil engines are used. This considerably facilitates

NEW WAREHOUSE AND OFFICE BUILDING OF THE CAN. FAIRBANKS-MORSE CO. AT VANCOUVER, B. C.

Buildings' Layout.

A very complete system of industrial tracks has been installed, the tracks be- the handling of materials. There is in addition a spur from the Grand Trunk Railway running through the yard to



the warehouse building at the north end of the plant, with a branch to the machine shop.

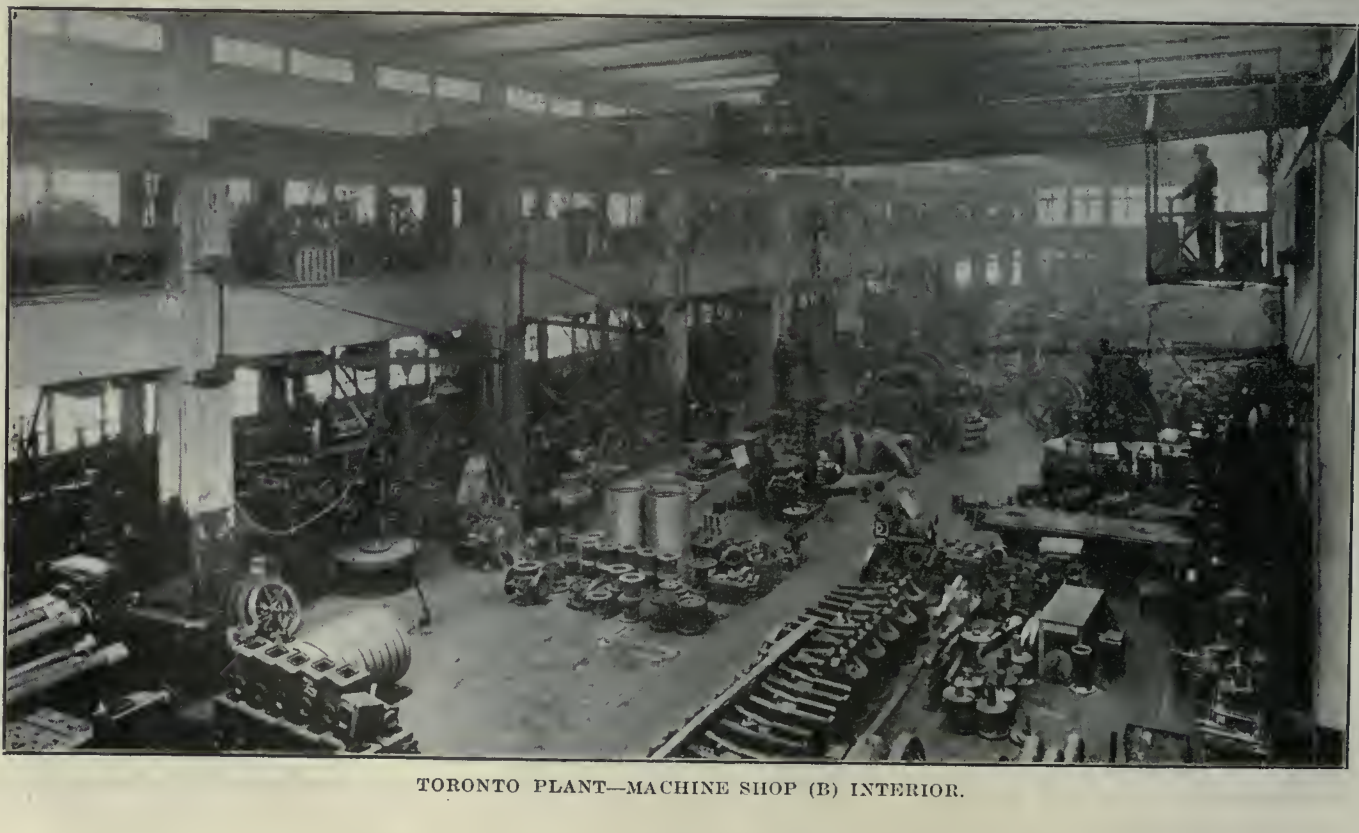
Beginning at the north end of the property, there is the warehouse building, 134 ft. 6 in. x 80 ft, four storeys high, and of substantial mill construction. On the roof is a 30,000 gallon tank for the sprinkler system, and on the west side is the pipe shed, 101 x 52 ft., for storing stand pipe and other castings. This building has shipping platforms on two sides. Beyond is the cleaning room, 103 x 47 ft. 6 in., with a pattern shop and storage above. This building is also of mill construction. Adjoining is the grey iron foundry, 330 ft. 6 in. x 100 ft.; one section being used as a core room, and another section as the brass foundry. The old reinforced concrete building with concrete columns and monitor roof embraces 230 ft. of the total length, while the remaining 100 ft. is accounted for by the new brick extension with steel columns at the south end.

On the east side of the plant is the machine shop, 266 ft. long x 100 ft. wide. This building is of reinforced concrete construction, with concrete columns and roof. The clear height from floor to roof is 30 ft. 6 in., and floor to crane rail 24 ft. The main bay is 51 ft., being exceptionally wide for this type of construction. The gallery floors are 14 ft. above main floor, and there is 12 ft. clear above the galleries. Outside this shop, on the west side, and extending the full length, is a castings storage, over which operates an overhead hand travelling crane, 30 ft. span, and equipped with a 3 ton Yale & Towne electric hoist.

In the centre of the property is the power house, 102 ft x 80 ft., and a test and paint shop, 100 x 71 ft. All these buildings are of reinforced concrete construction. At the south end is the new tractor shop, 397 ft. x 100 ft., built of reinforced concrete and brick. The columns and roof trusses are steel and the wood roof is covered with roofing material. The windows have "Fenestra" steel sash and ribbed glass. The height from the main floor to gallery floor is 19 ft. and to the crane rail 30 ft. In the yard alongside the track is a sand and coke storage, and at the west side the steel storage with fuel oil tanks adjoining. In other parts of the plant are a transformer house, stables and carpenters' shop.

The buildings are all heated by coils around the walls just above the floors, low pressure steam is supplied from the boilers. All the buildings are equipped with a sprinkler system installed to the specification and under the inspection of the Manufacturers' Fire Insure Co., Boston, Mass. The tank for this system is supplied from the city mains, which are also directly connected to the system. A number of hydrants are located at various points as an additional precaution against fire. A concrete tun-

TORONTO PLANT—SECTION OF FOUNDRY.



TORONTO PLANT—MACHINE SHOP (B) INTERIOR.

nel, 6 ft. x 6 ft., connects the power house with the tractor building and carries light and power cables, high and low pressure steam mains and a compressed air line. Under normal conditions of trade about 1,000 men are employed.

T. Pringle & Son, Ltd,, factory architects, Montreal, were responsible for the layout and design of the various buildings.

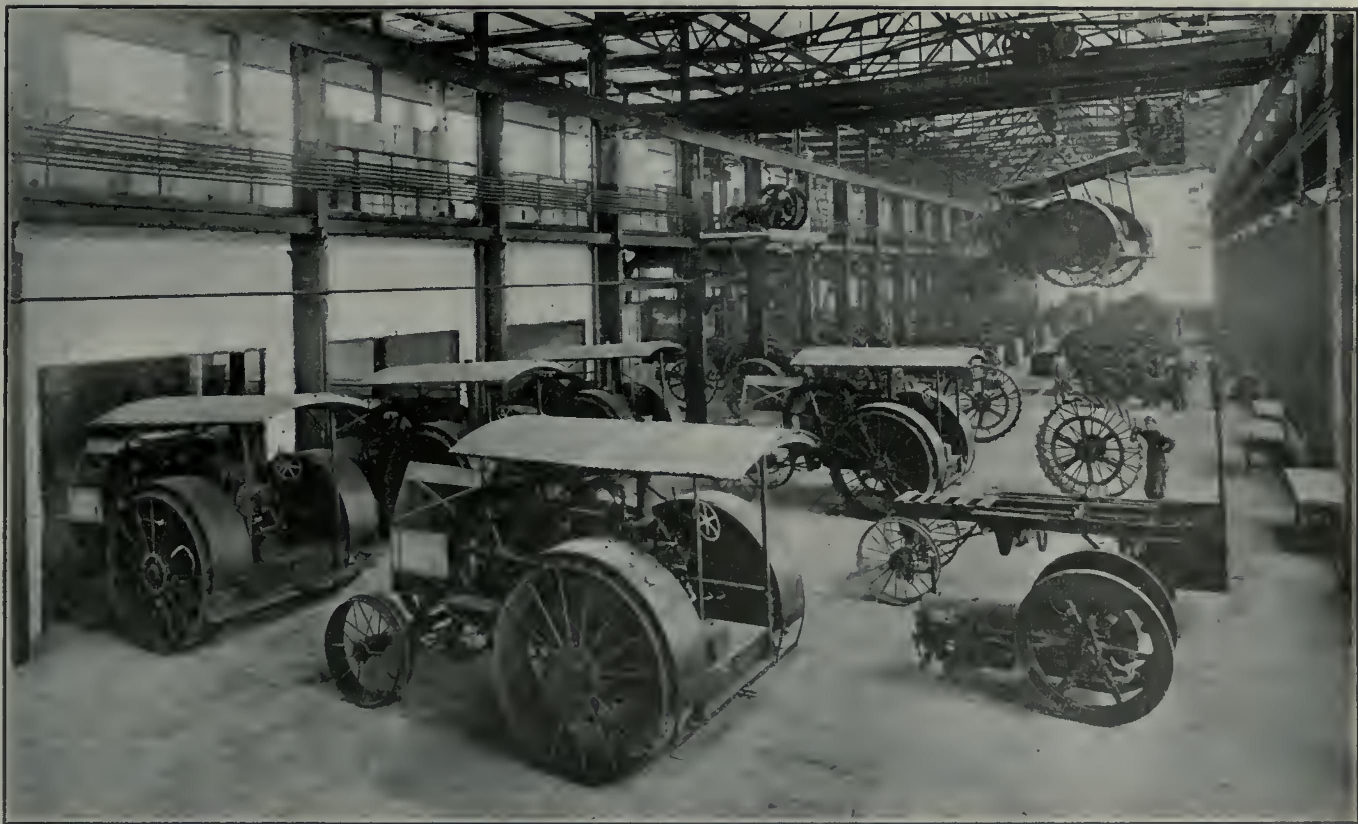
Foundry and Pattern Shop.

The foundry is laid out in three bays, the centre bay being 46 ft. 6 in. wide, and the side bays 26 ft. 9 in. wide. The core room occupies 130 ft. of the west bay, and outside a lean-to has been built to accommodate 8 core ovens; four being fitted with racks and four being car ovens. They are all heated with coke and fitted with Kinnear rolling doors. At the south end of the east bay 100 ft. has been appropriated for a brass and aluminum foundry, in which are four crucible furnaces. North of the brass foundry are the No. 8 and No. 5 "Whiting" cupolas, with Roots blower, driven by a 40 h.p. motor. The charging floor is served by a 7-ton electric hoist operated by a 10 h.p. motor. There is a Fairbanks scale on the charging floor. A 5-ton Niles electric overhead travelling crane is installed in the main bay, also a hand operated travelling crane, with a 2-ton Yale & Towne triplex block. Additional equipment and appliances consist of jolt rammers, Adams squeezers and a Paxson magnetic separator.

At the north end of the foundry is the cleaning room and finished castings storage. In this room are installed tumbling mills, grinders and an overhead runway system, equipped with a 1½-ton Yale & Towne triplex chain block. Castings are carried from the foundry to any part of this room. Above the cleaning room is the pattern shop and pattern storage. The pattern shop is at the east end, and is equipped with 2 Cowan planers, a Gardner grinder, band saw, and a circular saw by the Crescent Machine Co., Leetonia, O. The line shaft is fitted with "Skefko" ball bearings, and is driven by a 20 h.p. motor.

Machine Shop.

The main machine shop has three bays, the centre having a span of 51 ft., over which operates an 8-ton Niles electric crane. There are two rows of roof lights in addition to the side windows. Galleries, 24 ft. 6 in wide, extend along the full length of each bay and along the north end of the main bay, with stairways leading up to each. At the north-west corner of the main floor are the superintendent's office, drawing office and timekeepers' office, while at the north end most of the heavier machine work is done; as a consequence, the majority of the larger machine tools are located there. The principal tools include a 2-spindle horizontal boring machine, by Bearman & Smith Co., Providence, R.I., which is used principally for boring pump cylinders; a Bertram engine lathe for turning crank shafts, and a Niles lathe for the same purpose; a Bertram vertical motor driven boring mill for general purposes, and a Lapointe broaching machine. In the east bay are several Bertram radial drills, a ten spindle multiple drill by Manning, Maxwell & Moore Co., New York, and a Fosdick radial drill. In the centre are two Bertram horizontal boring machines for boring cylinders and pump base castings. Further down are two vertical turret lathes by the Bullard Machine Tool Co., Bridgeport, Conn. In addition to the above mentioned equipment, there are several standard machines for general purposes.



TORONTO PLANT—OIL TRACTOR ERECTING SHOP.

The gallery at the north end is devoted to the manufacture of repair parts and assembling stand pipe valves. Small parts, such as igniters, fuel pumps, reservoirs and small valves are machined and assembled at the north end of the east gallery. Adjoining this department is the grinding and polishing shop, where are several grinding machines by J. G. Blount Co., Everett, Mass., and at the south end is the tool room and tool stores. In this room the usual tool makers' machines are installed, such as Brown & Sharpe and Becker milling machines, a grinding machine by Brown & Sharpe, Bickford drill presses, several Hendey lathes, and a Gould & Eberhardt gear machine. The line shaft is driven by a 15 h.p. motor. The west gallery is devoted entirely to the storage of finished parts.

Returning to the main floor at the south-east end are several Pratt & Whitney semi-automatic turret lathes, a Pfauter gear hobbing machine, a Hall pipe cutter and a Gisholt turret lathe. Near this department is a Bertram gapped lathe for machining fly wheels. At the south end is the assembling department, where the engines, pumps, etc., are completely finished preparatory to being tested. Testing in the case of the larger engines is done in a separate building, but the smaller sizes and marine engines are tested in this particular shop, the test stands being ranged along the south wall. There are thirteen test stands, to which fuel oil is pumped. In some cases the marine engines are coupled up to a shaft, to which a propeller is connected outside the building and immersed in a tank of water. In other cases, a fan is substituted, revolving in free air. The engines are run at a high speed, and all adjustments made that may be found necessary. Following the test they are ready for painting and shipping.

TORONTO PLANT—FABRICATION SHOP FOR TRACTION ENGINES.

A standard gauge track runs into the machine shop far enough to permit cars being loaded from the assembling floor. Fixed to the columns are a number of jib cranes with ½ ton air hoists. The machines on the ground floor are grouped in sections, each section being driven by separate motors varying from 30 to 40 h.p. In a few cases the tools are driven by individual motors. There are two 2-ton electric freight hoists, supplied by the Kieckhefer Elevator Co., Milwaukee, one serving each gallery midway in the shop. Near the elevator under the gallery on the east side are the tool stores.

Testing and Painting.

The stationary oil engines after being assembled, are taken to the testing shop, which occupies two sections of one building, while the third section constitutes the paint shop. Each section is served throughout its whole length by a hand operated overhead travelling crane equipped with a 3-ton Yale & Towne triplex block. In the test shop, the engines are subjected to a brake test and all necessary adjustments made. Each test-stand has a separate oil fuel supply which is pumped from the oil storage. There is an exhaust connection to the outside on each test stand. In the paint shop the engines are painted and given the finishing touches preparatory to shipping.

Tractor Shop.

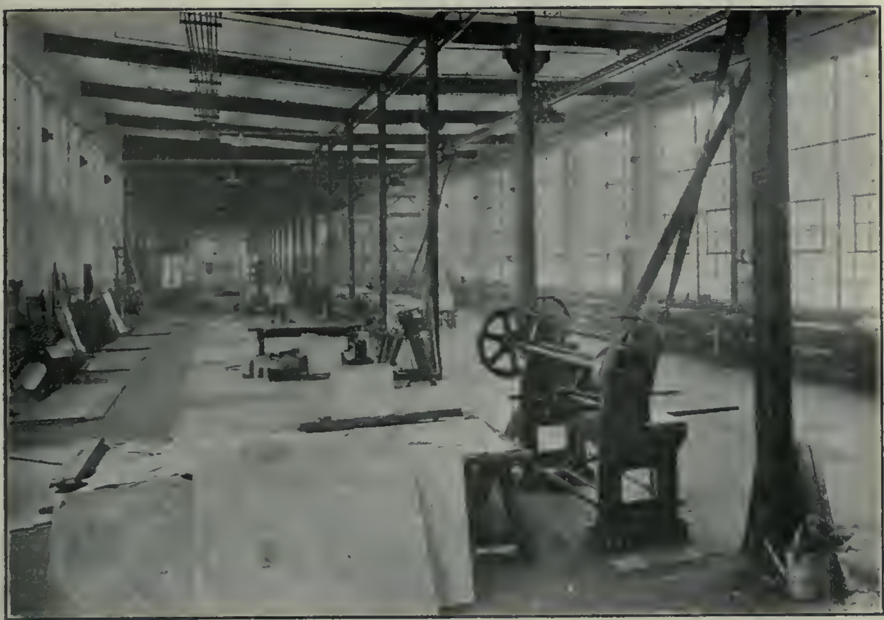
The tractor shop is a new building of modern reinforced concrete and brick construction, 397 ft. x 100 ft. On the north side is a gallery 322 ft. long and 50 feet wide where the galvanized iron cooling water tanks are made for the tractors, etc. The forge shop 100 x 50 feet is located on the south-east end and at the north-west end is the tractor paint shop and storage 75 x 50 feet. Operating over the full length of the main floor is a 12-ton Niles electric crane. Industrial tracks are laid through the forge and on the ground floor under the gallery there are two tracks with turntables at intersecting points. A part of the ground floor under the gallery is devoted to making tractor road wheels. Here the rims are rolled and punched, a Bertram punch and plate rolls being used for these operations. This section is served by a hand operated hand travelling crane equipped with a 3-ton Yale & Towne triplex block, and by two hand cranes with 1-ton Yale & Towne chain blocks.

In the forge shop are 9 smith's fires and 4 oil-fired furnaces, draft being supplied to these by a Roots blower driven by a 15 h.p. motor. Pipes are installed for the air supply to the fires and furnaces, and a blower carries away the smoke from the fires to a steel stack. There are two Bertram steam hammers of 1,200 and 4,000 pounds respectively. There are also an upsetting machine by the Acme Machinery Co., Cleveland, a bulldozer, a Bertram bolt-shear and a Bradley cushioned power trip hammer. At the west end are two case-hardening furnaces. The line shaft is operated by

TORONTO PLANT—ERECTING FLOOR, MACHINE SHOP (A).

a 25 h.p. motor, and the blower by a 15 h.p. motor.

For manufacturing tanks in the gallery, there are a Toledo electric welder, a 4 ft. gate shear by the Niagara Machine Tool Co., Buffalo, and circular shears by the same firm. A power press and Keene brake are also installed, two Otis Fensom two-ton electric freight hoists are installed, and a stairway is provided for the employes. There are also two platforms projecting from the gallery over the main floor for use in connection with the travelling crane.



TORONTO PLANT—SHEET METAL DEPT. TRACTOR BUILDING.

Power Plant and Distribution.

Hydro-electric power is used and is stepped down at the transformers from 13,200 to 550 volts. The switchboard was installed by the Canadian Westinghouse Co. It has eleven grey marble panels, two only of which are being used at present. The usual equipment of ammeters, voltmeters and circuit breakers furnishes the different panels.

There is a Canadian Fairbanks 40 k.w. 25-cycle, 3 phase, 750 r.p.m. motor generator set for supplying d.c. current at 220 volts to the crane motors. Power is distributed to the motors in the various shops at 550 volts and 110 volts to the lighting circuit. Canadian Fairbanks Co. motors are installed throughout, and Mazda and Sunbeam 200 watt and 400 watt lamps are used for lighting.

A Canadian Rand air compressor supplies air to the plant. This machine is steam driven, having cross compound steam and air cylinders, the steam cylinders being 11 and 18 in. diameter, and the air cylinders 16 and 9 in. diameter, by 16 in. stroke in both cases. The compressor has a capacity of 744 cub. ft. of free air per minute against a pressure of 100 pounds at a speed of 200 r.p.m. A Canadian Fairbanks 6-8-12 vacuum pump takes the drains from the heating coils and returns them to a Cochrane feed water heater. Two Canadian Fairbanks 6-4-6 boiler feed pumps are also installed.

In the boiler room is a battery of four boilers which consists of one 150 h.p. Babcock & Wilcox water tube boiler having a working pressure of 150 pounds; two Brownell return tubular boilers and one return tubular boiler by the John Inglis & Co. The three latter boilers are of 75 h.p. each, and have a working pressure of 70 pounds. The steel stack is 100 ft. high by 40 in. diameter. At the back of the boiler room is the coal storage.

Marine Engine Department.

The assembly for marine oil engines is on the third floor of the warehouse building, and the machine shop for this department occupies the fourth floor. On the third floor are a number of stands where the engines after being assembled are limbered up which is a kind of preliminary test to see if they have been assembled correctly. The line shaft in connection with these stands is driven by a 15 h.p. motor, and a portable crane is used for handling the various parts. At the end of the shop is a finished parts storage.

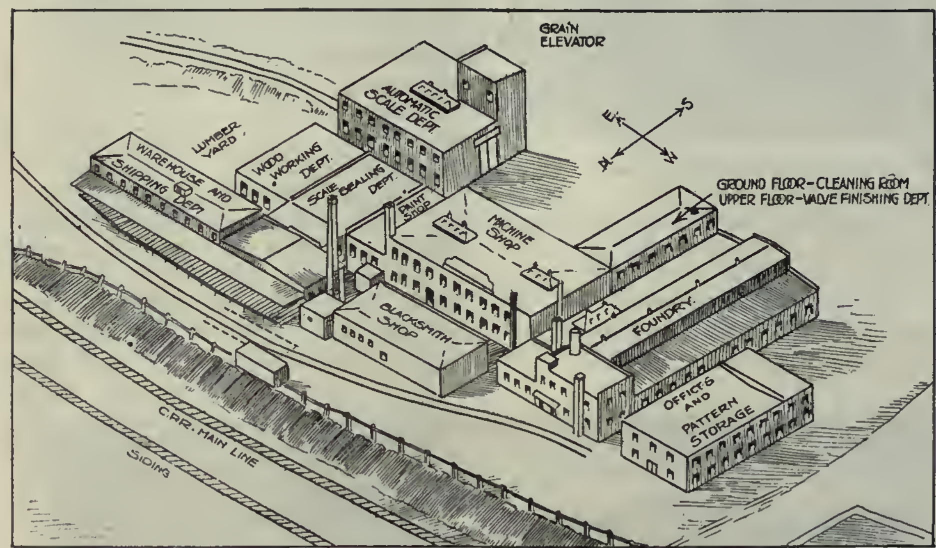
The fourth floor is the marine engine department machine shop, and is devoted entirely to the manufacture of this type of engine. In the centre is a crib or store for tools. There are in this shop a number of tools for general purposes, and among others, a Steinle turret-lathe for boring engine cylinders, and a Heald internal grinder for finishing the cylinder bore. The bottoms of cylinder castings are machined on an Ingersoll 2-spindle miller, and helical gears are cut on a gear-machine supplied by the Lees Bradner Co., Cleveland. There are radial drills by Bertram and the Cincinnati Bickford Co., a Brown & Sharpe Universal miller, a Norton

TORONTO PLANT—SECTION OF MARINE ENGINE SHOP.

grinder for finishing crank shafts and a Bertram engine lathe for turning them. The cylinders are drilled at one operation by a 20-spindle multiple drill by the Fox Machine Co., Grand Rapids, Mich. The line shafts are equipped with "Shefko" ball bearings and are driven by three 30 h.p. motors.

Warehouse Building.

The warehouse building is of substantial mill construction, 134 ft. 7 ins. x 80 ft., and four storeys high. The basement is used as a general storage and the first floor is occupied at the north end by the general offices, the remainder constituting the shipping and receiving departments. This floor is well laid out for the purpose. On the west side and inside the building, a standard gauge track is installed being connected to the main spur in the yard. The industrial system also runs into this department and in the same section near the roadway is a platform for teams. An 8-ton Niles overhead electric crane 23-ft. span operates over the tracks and shipping platform and also serves the second floor which is broken to give the crane a clear way. The arrangement makes two floors available for shipping or storing and the goods are handled with the greatest dispatch. Heavy goods are taken care of on the first floor and lighter goods, such as small engines, are stored on the second floor. Two Turnbull electric freight elevators of 2-tons capacity are installed in this building and serve all the floors. All door and elevator well openings have fireproof sliding doors. A sprinkler system is also installed. On the east side, outside, is a shipping platform for teams and at the corner near the roadway is the time office where a time clock, furnished by the International Time Recording Co., Toronto, is installed. Outside the time house is a 20,000 pound capacity Canadian Fairbanks wagon scale.



E. & T. FAIRBANKS CO. PLANT, SHERBROOKE, QUE.

Commercial Cost and Production Accounting Methods.

A somewhat simple though extremely efficient cost and production system is in force at the Toronto plant of the Canadian Fairbanks-Morse Co. The system embraces practically all departments. The accounting methods used embrace within commercial books what is termed tied-in cost and production records. Materials arriving at the plant are charged to various stores accounts and are disbursed from various stores departments upon requisition blanks or shop production orders, and charged to "Work in Process Account." All entries covering amounts of these goods are entered in the aggregate on regular books of account, the balance shown in the books at the end of the month representing the inventory value of such material in the various stores accounts. All materials are placed in racks or bins in the store room except in the case of large pieces which are stored in a place designated for such. All bins are marked with floor section and bin numbers.

In the general office, a stock ledger account is kept of raw materials entering the plant and the disposition of same. Constant recount is obtained during the year of the various materials, and adjustment made in the stock ledger and general account books, thus keeping quantities and values always correct. Each page in the stock ledger bears information concerning the floor, section, and bin number, designating exact location for storage of various materials. The benefit of this system is that materials can be located with the least amount of delay or expense.

Further information obtained from stock ledger sheets includes drawing number, symbol, name of part, product used on, maximum or minimum stock carried, unit value and weight of material, and in the case of machine product, labor cost as well as material cost.

The fiscal year ends on December 31, and on the first of that month, these stock sheets are all listed on an inventory sheet in the same order as carried in the ledgers, being priced and completed except quantity, and leaving blanks for the latter or piece numbers. Thus at the end of the year all that is necessary for inventory figures is to call the number of pieces or quantity shown in hand at Dec. 31st after which there only remains the extensions and totals.

All materials are ordered by the distribution department which has charge of the storage and disbursement of materials on the plant. No accounts are kept on general books with creditors but all accounts are merged into "Accounts Payable." The voucher cheque system of payment is used very successfully. All invoices are listed on the reverse side of voucher cheque, a carbon copy being taken of same. Invoices are rivetted to the carbon copy and voucher cheques credited to "Accounts Payable" and charged to some Plant Asset, material or Burden Account. This entry is taken care of through a voucher register, and the voucher cheques are filed away under due dates. As these various due dates mature, the cheques are taken from the file and entered in cash book being debited to "Accounts Payable" and disbursed to the various individual creditors as shown by the vouchers.

The balance of accounts payable always represent amounts due creditors. This system eliminates individual creditor accounts and automatically informs the treasurer when the accounts are due.

All wages are paid semi-monthly in cash. The wages scheme being a modification of the premium system which uses time for its basis as distinct from money value in piecework. The men on entering and leaving the plant punch the time on time clock cards and in each shop is a rack for holding these cards, numbers on the rack corresponding to those on the cards. The rack is locked by a timekeeper when the whistle blows, and any man who has not his card in place is counted late or absent as the case may be. All distribution of time to cost accounts is cared for by shop timekeeper who distributes time to plant numbers, burden numbers or otherwise. Time cards go to the time office and are checked with clock cards as to total time. The time is extended at various rates and in proportion to the various order numbers, after which it posted to the cost ledger.

Total labor distribution in cost ledgers is balanced with each payroll to the amount of payroll paid out. All labor on production material is charged to "Work in Process, account from cost ledgers. At the completion of each job.

sheets in cost ledgers are extracted and posted to a final article cost sheet showing detailed cost of all operations on each piece. The fluctuations of these costs are constantly noted and investigated. This ensures the elimination of losses before they have accumulated to any extent. On these cost cards, the final cost of the complete article being given, the proper burden is apportioned to same and cost credited to work in process account as various goods are completed. Thus the balance in ledger opposite work in process is inventory of unfinished work. As goods are shipped, cost of such goods is credited to inventory and charged to sales account, the billing value being credited to sales account and charged to the customer. The balance of sales account, therefore, at all times represents gross profits.

Following out the above system, the accounting department is able to draw off a monthly balance sheet showing in detail inventory of various raw materials on hand and also of the work in process, finished stock and amount of gross profit obtained from shipments. It is also able to draw up a report showing cost of material taken into shop, cost of product finished, cost of product shipped and considerable other valuable information for the management. Comprehensive exhibits of various burden accounts are carried separate from the main ledgers, showing in detail the amounts expended against 150 different expense accounts. Total of amount shown on this burden exhibit balances with amount shown to debit of one account carried in main ledger and designated burden account. From these burden exhibits, monthly burden rates are established for the various productive departments. All fixed expenses, such as depreciation, taxes and insurance, etc., are cared for by monthly estimate and adjusted at the end of the fiscal year.

Thus, expense or burden is checked very carefully in all its details and losses in that direction eliminated as much as possible at the time they occur.

Where Fairbanks Scales and Valves are Made.

One of the first lines handled in Canada by the Company was the Fairbanks scale manufactured by E. and T. Fairbanks & Co., at St. Johnsbury, Vt. By 1907, the sale of these scales had reached such a large volume that the manufacturers decided to supply the Dominion market from a Canadian factory. Land was consequently purchased at Sherbrooke, Que., and a company organized under the title of E. and T. Fairbanks & Co., Ltd. The entire output of this company is handled by the Canadian Fairbanks-Morse Company.

The Sherbrooke factory is situated on a site of seven acres and at the time of building (1907), was thought to be large enough to take care of the Canadian trade for many years to come. However, it has already proved too small, and during the past year an additional five acres have been purchased, on which new buildings will shortly be erected. As it stands to-day, the plant is twice as large as it was three years ago and still cannot meet the demands made upon it without the assistance of the present company at St. Johnsbury, Vt.

About 200 men are employed, the plant consisting of pattern shop, foundry, scale department and office building. The making of automatic scales was only commenced two years ago, but has already made great strides. The company supplied fourteen of these automatics to the Montreal Harbor Commission No. 2 Elevator, which was fully described in the issue of "Canadian Machinery," dated January 2, 1913. Each of these scales has a capacity of 6,000 lbs., and dumps every 30 seconds. They are the largest automatics ever constructed.

The shops at Sherbrooke are all of heavy mill construction, and are so arranged that the work passes through its various stages in a continuous line from foundry and blacksmith shop to the shipping warehouse. There is, however, an entirely separate department for the manufacture of automatic scales, this work being carried out in a building equipped with its own machine shop, etc., as will be presently described.

The Foundry.

The foundry runs north and south and is 165 feet long by 90 feet wide, divided into three bays. The cupola room stands at the north end of the main bay, and contains a No. 5 Whiting cupola, blast for which is supplied by a No. 9 Sturtevant positive type blower direct connected to a 50 h.p. variable speed motor. In addition to turning out grey iron castings, several moulders are kept constantly at work on brass, gun metal and aluminium castings, there being two pit fires for heating crucibles and doing the necessary mixing of alloys.

The middle bay is of course used for the heavier floor work and is served by a floor operated Niles electric travelling crane of 10 tons capacity. For serving the west bay, in which medium sized work is moulded, there is an overhead monorail runway extending down the

SHERBROOKE FACTORY—WAREHOUSE AND SHIPPING DEPARTMENT.

west side of the main bay below the 10-ton craneway. This runway curves across the north end of the shop in front of the cupola, enabling heavy bull ladles to be easily conveyed down the bay, the metal being poured into hand ladles at any desired point in the west bay.

The north end of the east bay is given over to brass moulding, the chief product being the Fairbanks globe and angle valves. These are moulded on two hand operated drop pattern machines. Of 1-inch valves six are put up at one operation, 75 to 80 moulds being turned out per day on each machine. Brass is melted in a No. 5 Hawley-Schwartz down draft tilting furnace burning crude oil, blast being supplied by a small motor driven blower of the Roots type. The remainder of the east bay is occupied by bench moulders and by a coke-fired drying oven for the dry sand moulds.

The foundry has recently been piped for compressed air and Tabor power squeezers and other moulding machines are about to be installed. Already a large number of flat and comparatively shallow articles are made from aluminum match plates and no means are neglected for reducing costs without sacrifice of efficiency. Thus, all holes for bolts and countersunk screws are cored out to save labor in the machine shop. Even tapping holes as small as $\frac{3}{8}$-inch are cored, an oil sand core of course being used.

Scale pivots, or knife edges as they are sometimes termed, are first forged in the blacksmith shop and then sent to the foundry where they are carefully set in the moulds and thus cast into place in their levers. They are forged with a slight taper in their length to enable them to be driven out in the cleaning room for the purpose of hardening and grinding. When being forged they are heated in an oil furnace to avoid the formation of scale, and before being placed in the mould they are dipped in coal oil for the same purpose. If scale were allowed to form on them it would be practically impossible to drive them out of their levers for hardening, etc.

The core room is located to the east of the cupola room and gives employment to several men and women. It is equipped with a Hammer core machine and Millett drawer oven. The employment of women for core-making is perhaps not so common an occurrence in this country as it is in the United States. It is an employment well suited to a woman's deft fingers, however, and the Fairbanks Company receive many more applications from girls for employment on this class of work than they are able to entertain.

SHERBROOKE FACTORY—INTERIOR OF MACHINE SHOP.

The Cleaning Room.

The cleaning department has recently been rebuilt and reorganized, and is now thoroughly up-to-date in every way. In

SHERBROOKE FACTORY—EXTERIOR OF MACHINE SHOP.

This photograph was taken previous to the erection of the blacksmith shop, the foundations for which are seen in the foreground.

fact it is one of the best features of the factory, being run on very interesting lines. It lies to the east of the foundry and is quite distinct from that department, having a separate foreman. The equipment includes a sprue cutter and three Sly exhaust tumblers, one being 20 in. x 48 in., one 22 in. x 84 in., and the third 32 in x 44 in. Castings which one would think it practically impossible to clean by tumbling are here satisfactorily treated. Intricate pieces with light lugs cast on are successfully tumbled, the finish thus secured being very much superior to anything that can be obtained by the scratch brush method, In the illustration of the machine shop, a triangular cast iron lever may be seen leaning against one of the shop columns to the left of the picture. This is a specimen of work that is cleaned by tumbling. Of course the tumbler barrels are not carelessly filled with a promiscuous collection of castings, but are carefully packed with a number of pieces all of one class. By this means very satisfactory results are obtained, the occasional very small loss of money due to broken castings being as nothing compared with the greatly reduced cost of cleaning.

In the middle of the cleaning room is a wood-lined sand blasting chamber, containing a Sly sand blast outfit. The sand and dirt fall through a large floor grating into a pit, whence an exhaust fan draws them into a separator chamber on the roof. From here the sand is separated from the dirt and returned to the tank. The exhaust piping from the three tumbler mills discharges to a dust arrester, the sand gravitating to a hopper having an outlet outside the cleaning room. The parting sand being heavier than the facing sand naturally gravitates to the bottom of the dust arrester, consequently when the discharge gate of the hopper is opened, the parting sand makes its exit first and is caught in a receptacle for use again. The facing sand follows, and is thrown away. It is easy to tell by the appearance of the discharge when the facing sand begins to make its appearance.

Checking Castings.

Although a very large number of castings of all kinds and sizes are always passing through the factory in various stages of progress, the office can check up the number each day by a system of reports that has been established. When an order is received for (say) 100 scales of a certain standard pattern, the office issues an order on the foundry for the necessary number of castings. These, the foundry delivers in lots each day to the cleaning room, and sends in a daily report to the office of the number of castings made. The office sends a list next day to the foreman of the cleaning room of the casting reported as having been delivered to him the previous day. He inspects the work and gives a report as to the number and weight of the good and bad castings respectively. The office is thus kept informed of just what is turned out, and can keep track of the shrinkage.

The cleaning room delivers the good castings to the various departments such as machine shop, stock room, or automatic scale department, and gets a receipt for same. The receipt is made in triplicate, one copy being retained by the department accepting delivery of the castings, one being handed to the cleaning room and the third being sent to the office. In this way the office knows exactly the number and weight of castings passing through the factory at any time. Similarly, as castings are machined, they are passed to another department, the foreman of which gives a receipt for them, thus enabling the office to keep track of the progress of work on each lot.

Machine Shop.

The machine shop, paint shop, scale sealing department and wood working department lie contiguous to one another in a line at right angles to the foundry. The machine shop is admirably equipped with thoroughly modern tools arranged in the side bays. The illustration fails to do it justice, it being an awkward shop to photograph satisfactorily. It is 100 feet by 60 feet wide, and is divided into three bays of 20 feet each. The centre bay is equipped with a 7½ ton Niles electric traveller operated from the floor, and in addition there is a monorail runway by which castings are brought from the cleaning room. This runway extends the full length of the shop, and continues on through the paint shop sealing department, and woodworking shop. It then takes a turn to the south, and finally terminates in the automatic scale shop.

At the head of the machine shop a space has been partitioned off to form a compressor room. In it is a Canadian Ingersoll-Rand two stage, centre crank air compressor of 320 cubic feet capacity, belt driven by a 50 h.p. motor. The work done in this shop includes machining of parts for all sizes and types of scales except automatics. Scales of 500 lbs. capacity and up are built on the ground floor, lighter scales being put together in the galleries, of which there is one over each side bay. These galleries also do the beam work, poises, sheet brass work, etc.

SHERBROOKE FACTORY—OFFICE AND PATTERN STORAGE BUILDING WITH FOUNDRY

The machines in the side bays on the ground floor are belt driven, the shafting running in Skefko ball bearing hangers. An interesting machine is one patented by E. & T. Fairbanks & Co. On it the pivot edges are milled to gauge, thus doing away with the old method of hand filing. Other fine tools here are a 24-inch Potter & Johnston shaper, No. 2B Milwaukee universal milling machine, and several Flather lathes. There is also a full equipment of drill presses. Steel bearings are ground on an automatic grinder made by the Diamond Machine Co., Providence, R.I.

In addition to the work already mentioned, polishing, buffing and plating are done on the galleries. The tool room is also located there. On the same level as the south gallery and leading out from it is the valve shop. This is located above the cleaning room, and is a new department, having only gone into operation in June last. Here the Fairbanks globe and angle valves are machined, assembled and tested. Along one side of the shop are ranged eight turret lathes and three 2-spindle millers, all by Warner & Swasey. On the other side is the test bench, where all the valves receive a hydraulic test of 300 lbs. per square inch. From the test bench they are placed on a truck and removed in batches to the packing benches. It will thus be seen that there is no lost motion whatever, the castings on entering the shop passing down the line of turret lathes on one side and returning up the other side to the testing and packing benches.

SHERBROOKE FACTORY—MAIN BAY OF FOUNDRY, LOOKING NORTH.

The Blacksmith Shop.

The blacksmith shop runs parallel with the machine shop, and contains six Buffalo down draft forges and four Dupont hammers. There is also a bolt machine for forging bolts up to $1\frac{1}{4}$ inches diameter, this being served by a rotating rod heating furnace. The west end of the shop is occupied by an extensive iron rack, with shears situated conveniently near by. The scale pivots are all forged here, and after being cast in place in the levers are driven out and brought back to this department for hardening.

The Paint Shop.

This is a two-storey building, located between the machine shop and the sealing department. Small work is here dipped in Japan and baked, there being two baking ovens, 6 ft. x 14 ft. These will each accommodate two cars 4 ft. x 6 ft. Large work is brush painted, all this being done on the ground floor. The finer work, such as sign painting, enamelling and varnishing, is done on the upper floor.

Sealing Department and Packing Room.

The scale sealing department is one of the most important in the plant. Here the scales are assembled and carefully adjusted for accuracy and sensitiveness. Every scale is tested against standard weights, and has to pass a Government inspection before leaving the factory.

Scale adjusting, or "sealing" as it is technically called, is work that calls for a great deal of patience, together with a high degree of conscientiousness, on the part of the workman. A man of a nervous temperament, who, to use a slang term, gets easily "rattled," is useless on this class of work. Of two exactly similar scales one may perhaps be accurately adjusted in a couple of hours, while the other may occupy a man's time for four or five days before it is finally made sufficiently sensitive and accurate to comply with the high standard set by the Fairbanks Company.

Part of this shop is used as a packing department, the scales being here packed and crated before passing to the warehouse which lies alongside.

Woodworking Department.

Next to the sealing room comes the woodworking department, which is equipped with the usual band saws, surfaces, etc. Here are made beam cupboards, wood scale frames, wood platforms and similar carpenter work. Because of the factory standing on a site with a decided slope to the east, advantage has been taken of this feature to provide roomy basements below the woodworking and sealing departments, and also under the automatic scale shop. In the woodworking basement, further machinery has been installed, packing cases, crates and foundry flasks being made here and afterwards raised to the upper floor on an elevator. Here, too, are located two steam heated dry kilns. The space below the sealing room floor is used for storage of stock parts, of which there is always a large number on hand. The automatic shop basement is used for a similar purpose.

Below the warehouse there is also a basement in which are two 60 in. x 144

SHERBROOKE FACTORY—INTERIOR OF AUTOMATIC SCALE DEPARTMENT.

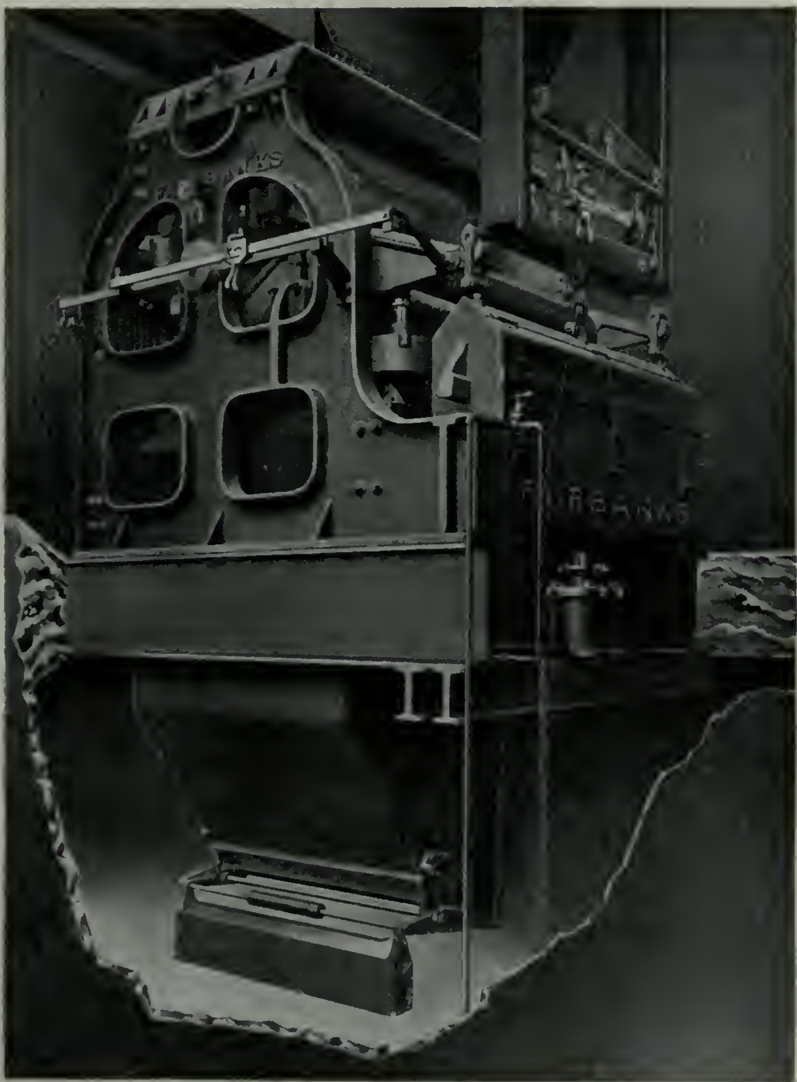
in. return tubular boilers built by the Jenckes Machine Co., Ltd. These supply steam for the heating system, all buildings being heated by direct radiation. Power for operating the factory is purchased from the Sherbrooke Municipal Hydro-Electric system.

The Automatic Scale Shop.

Automatic scales are largely used for weighing grain, peas, rice, coal, sand, cement, ore, etc., in large quantities. They may be made to work continuously or for sacking purposes. In the latter case, the working is controlled by a foot lever, and the machine is usually mounted on wheels to enable it to be run to any position.

The construction of the machine is roughly as follows:—At one end of two parallel weighing levers is suspended a weighing hopper, with a dumping door in the bottom. At the other end of the levers is a receptacle in which counterpoise weights are placed. Above the weighing hopper there is supported on the frame of the machine a feed hopper, into which the material being weighed is discharged from the storage bins. The counterpoise weights transmit their force to an admission gate at the mouth of the feed hopper. On a certain joint being automatically broken, this admission gate is opened, and the grain, or other material, falls into the weighing hopper. When the weight in the latter corresponds to that of the counterpoise, the supply of grain is automatically cut off and the contents of the weighing hopper are automatically dumped. The counterpoise then returns the scale to its original position, and the operation is repeated.

The Company make these scales in capacities from 15 pounds up to 6,000 pounds per dump. They are now engaged in getting out a new design, which they think will eliminate the defects that have hitherto been found in this type of scale.



Fairbanks Automatic Scale supplied to Montreal Harbor Commissioners' Terminal Elevator, No. 2. The scale has a weighing capacity of 10,000 bushels per hour and is designed to dump 6,000 lbs. of grain per dump, two dumps per minute.

The shop in which the automatics are made is a self-contained department, quite independent of the rest of the factory. It is 80 feet long by 70 feet wide, divided into three bays, with two galleries. The centre bay has a 10-ton Niles electric traveller, operated from the floor. The machine tools in this shop include, among others, a 42-inch x 14 ft. Detrick & Harvey open side planer, one 24-inch and two 12-inch engine lathes, sensitive drills, etc.

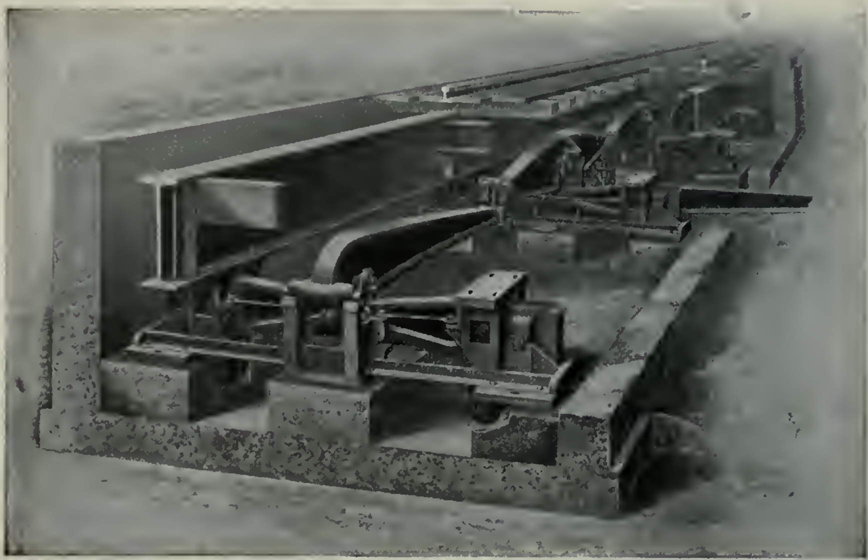
For testing out the automatic scales there is a grain elevator in one corner of the shop. It has a capacity of 6 tons per minute, and is divided into five bins, in order that different varieties of grain may be put through the scales. As the grain is dumped from the weighing hopper it falls through a grating in the floor to be again raised to the bins by steel buckets attached to an endless belt in the usual manner. In the illustration of this department, a number of frames for automatic scales are seen upon trestles in the centre bay. Of the two galleries in this shop, one is used for storage purposes, and the other forms a pattern shop.

Offices and Pattern Storage.

Patterns are stored in a building convenient to the foundry, and are indexed for ready identification. The building also accommodates the offices for the manager and for the timekeeping and accounting staffs. These are on the ground floor, the upper floor being occupied by the engineering department.

For fire protection there is a 50,000 steel tank, 75 feet above ground level at its base. This is fed by city pressure, and is connected to the sprinkler system throughout the factory. The city main is also coupled up to the sprinkler system, there being a check valve on this line and also on the line from the 50,000 gallon tank. Thus, if the city pressure equals a head of water higher than the tank, the water in the latter is held back, and vice versa.

All types and sizes of scales are turned out from this factory from a delicate chemist's balance up to large railway track scales of 200 tons capacity. These track scales are constructed in two styles—pit pattern and suspension pattern, the former being most commonly met with. A pit type track scale of 200 tons capacity is here illustrated, part of the pit walls and the platform being removed to show the levers. The total length of the platform of this scale is 67 ft. 4 in., and it was designed for weighing cars while travelling over the scale at five miles per hour. The main levers are so designed that the bearings are in contact with the pivots throughout their entire length, so that the load on the pivot per lineal inch is even less than on many lighter scales. The platform is suspended from the main levers by links to enable it to swing freely in all directions, thus reducing the wear on the pivot edges. An interesting feature of the design is that no nuts, bolts or rivets are used in assembling the suspension bearing, and by jacking up the platform the working parts can be taken apart without the use of a wrench.



FAIRBANKS 200-TON PIT-TYPE RAILWAY TRACK SCALE.

The suspension type of railway track scale is intended for situations in low wet ground, where the bearings of a pit scale would be liable to rapid deterioration from moisture and dirt.

In this type a structural steel framework is erected around and outside of the platform of a sufficient height to admit box cars and locomotives. The levers are arranged on top of this structure, i.e., 18 ft. or 20 ft. above rail level, and the weight on the platform is hung from the suspension levers by vertical rods. The levers are protected by a light roof, or the whole structure may be covered in. Instead of being of steel, the frame-work is sometimes built in concrete.

The Factory at Farnham, Que.

The Dominion Safe and Vault Co., Ltd., at Farnham, Que. is another Company which is affiliated with the Canadian Fairbanks-Morse Co., Mr. Fuller being its president. This plant covers approximately 5½ acres, of which area considerably more than 60,000 square feet is roofed in. The product consists of fire and burglar-proof safes and vaults, Tattersalls' midget flour milling plant, wood split pulleys, etc., all built to jigs and templates, so that parts will be interchangeable, the tools for this purpose being exceptionally complete.

The buildings proper consist of safe and vault shop, 200 ft. by 75 ft.; flour mill and pulley shop, 180 ft. by 75 ft.; woodworking department, 125 ft. by 75 ft.; and paint shop, 150 ft. by 50 ft. All are of brick construction, well lighted and ventilated. In addition to these there are several buildings for the storage of raw material, each department having its own storage in the immediate vicinity.

The tool equipment throughout is thoroughly modern, consisting of representative machines of each particular type. The group system of driving is followed, each group being arranged to give maximum efficiency. Power is furnished by five A. C. motors aggregating 107 horse-power. An auxiliary steam plant is kept in readiness in case of failure of the electrical supply. The latter is purchased from the Yamaska River Power Station.

The annual capacity of the plant is 1,500 safes or vaults, 40 flour mills and 15,000 to 20,000 wood split pulleys, making an aggregate output approximating eighty carloads per year. Excellent shipping facilities are afforded by both the Canadian Pacific and the Grand Trunk Railways.

Midget Flour Mill Product.

Another important product of the Farnham factory is the Midget flour mill, of which there are over 200 installed in Canada, besides large numbers in Europe and other quarters of the world. Before the introduction of roller milling, small communities were supplied with flour by small stone mills scattered throughout the country. With the demand for roller made flour ever increasing, these stone mills were gradually reduced to grinding feed, or fell into disuse altogether. With the advent of the small self-contained roller mill, such as the Midget, many small millers have been enabled to profitably resume operations and turn out a flour of far better quality than before.

The Midget mill will grind 4¼ to 4½ bushels of winter wheat per hour, or 4½ to 5 bushels of spring wheat. The floor space occupied by the entire outfit is only 8 ft. 6 in. by 4 feet, and its weight 3 tons. The power required to drive it varies from 3 to 4 h.p., according to the class of wheat being milled.

The roller section of the mill consists of two pairs of fluted break rollers and two pairs of smooth reduction rollers; all rollers are 5 inches in diameter and 14 inches long. The movable roller of the pair is in each case adjusted by an arrangement which makes it impossible for the rollers when once adjusted to get out of parallel. After numerous experiments, a special grooving for the break rolls has been perfected which, while thoroughly cleaning the bran, keeps it broad and preserves the inside of the grain pure from branny particles, so that there is no need for the middlings to be further purified below being reduced to flour on the smooth rolls. After each rolling, the stock is carried to the dressing section of the machine, where the flour is sifted from it; the middlings being conveyed back to the next pair of rollers.

The flour section of the mill consists of four centrifugal flour dressers, each 3 feet 6 inches long and 14 inches in diameter. These dress out the flour after rolling, drop the bran and shorts into separate sacks, and return the middlings to be re-rolled.

It will be seen that all the processes of a large roller mill are performed by the Midget mill, although, of course, on a much smaller scale.

General Observations.

In addition to the three factories above described, the Canadian Fairbanks-Morse Company have the Canadian agency for many leading American manufacturers, and are also selling agents for several prominent Canadian firms, such as the John Bertram & Sons, Co., Ltd., Dundas, Ont., and the R. McDougall Co., Ltd., Galt, Ont. The machine tool department is one of the most important handled by the Company, the business done by it amounting to a very large sum yearly.

The men under whose guidance the Company has reached its present prominent position among Canadian mercantile and manufacturing concerns are: Henry J. Fuller, president; Thos. McMillan, vice-president and secretary; C. Graham Drinkwater, vice-president; Percy G. Brooks, vice-president; Edward R. Whitehead, treasurer.

This well-known firm have recently completed an entirely new plant for turning out their line of hoisting engines, etc. As will be gathered from the following description and illustrations, it is an excellent example of the modern shops, which are now being erected all over the country by many of our smaller engineering concerns.

THE business now being so successfully conducted by the firm of Marsh & Henthorn, Ltd., was established at Belleville, Ont. in the year 1846 and has been run ever since without a break, though under several different managements. The present owners are widely and favorably known as manufacturers of hoisting machinery, contractors' supplies, boilers, etc., but originally the output consisted of ploughs, mowers, and others farming implements. Later, the manufacture of stoves was taken up, and at one time all the Babcock & Wilcox boilers used in Canada were built here.

When Messrs. Marsh & Henthorn acquired the business in the year 1897 they decided that the wisest course would be to concentrate on one particular line of work, and the stove and farm implement business was gradually dropped. The building of Babcock & Wilcox boilers was also discontinued and the firm devoted their entire energies to developing a first-class line of hoisting machinery. This special product of theirs is now to be met with in very many mining and lumber camps throughout the Dominion, and is also a general favorite with the leading contractors of the country.

The success attending the efforts of the firm to supply a thoroughly reliable hoist at a reasonable price soon met with gratifying success, and the old premises on Mill street grew more and more congested and unsuitable to the needs of the rapidly growing concern. It was, therefore, decided to build a new and up-to-date plant, and for this purpose a site of 9 acres was secured on the north side of the Bay of Quinte, a short distance to the east of the Steel Company of Canada rolling mills. The buildings were finally completed early in the spring of this year, since when the plant has been in active operation, with a greatly increased productive capacity as compared with the old factory.

General Layout.

As may be seen from the plan, the new shops are well laid out to facilitate inter-communication between departments, while at the same time allowing ample space for future extensions. The site is adjacent to the main lines of the Canadian Pacific and Canadian Northern Railways, a spur from the latter traversing the property and serving the foun-

VIEW SHOWING ERECTING BAY IN MACHINE SHOP.

dry storage bins, erecting shops and boiler shop.

All the buildings are of heavy mill construction, with steel roof trusses. Good natural lighting is afforded by large windows fitted with Fenestra steel sash, while artificial illumination is by tungsten lamps of various sizes, as will be mentioned more particularly later. The shops are electrically operated, 3-phase current at 220 volts, 60 cycles being purchased from the Trenton Electric & Water Company. Each building is heated by direct radiation on the Webster system, the installation having been put in by the Marsh & Henthorn Company themselves.

Pattern Shop and Storage.

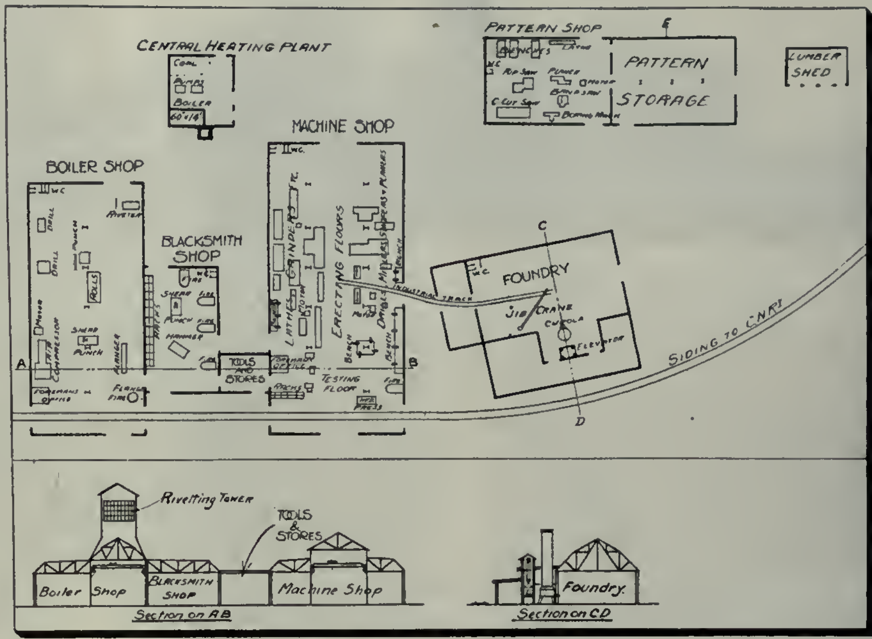
The pattern shop is a one-storey building, measuring 60 ft. by 40 ft., and provides accommodation for six or seven men. The equipment is of a standard character and includes ripping and crosscut saws, band saw fitted with tilting table, 12-inch planer, borer, turning lathe, trimmer, etc. Artificial lighting is by 60-watt tungsten drop lights fitted with holophane reflectors.

The firm's product consisting as it does chiefly of their own standard hoisting engines, it follows that the number of new patterns to be made is not large, hence three or four men suffice to keep in repair the large number of standard part patterns and to produce the few new patterns as may be called for from time to time.

The pattern storage is a two-storey building of the same area as the pattern shop. It is of absolutely fire proof construction with floors and roof of reinforced concrete. Access from the pattern shop is by regulation sliding fire doors. The ground floor is used for the storage of the larger patterns, while the smaller are stored upstairs on shelves, and so arranged that they may be quickly located by means of a card index system.

The Foundry.

The foundry is engaged solely in producing grey iron castings, the firm buying the few brass castings they use from outside sources. The building measures 90 ft. by 40 ft., there being a lean-to measuring 72 ft. by 27 ft. to accommodate the storage bins. The latter, as previously mentioned, are directly served by the yard trackage system, enabling sand, coke, pig, etc., to be unloaded direct from car to bin.



LAYOUT OF THE MARSH & HENTHORN PLANT.

The cupola is a No. 3½ Whiting, of standard construction. Blast is provided by a Buffalo Forge Co. No. 6 Noiseless Blower, which is belt driven by a Canadian General Electric 15 h.p. induction motor. Pig, scrap, etc., are raised by the usual elevator to the charging plat-

VIEW LOOKING DOWN CENTRE OF MACHINE SHOP.

form and are there weighed on a portable platform scale.

All moulds are made in green sand and when business is brisk about 15 moulders are employed in this department. An industrial track connects with the machine shop, a 5-ton jib crane in the foundry being used to place the heavier castings upon the trucks. This crane also serves to convey the heavy bull ladles from cupola to moulds. The cleaning department is located in a lean-to outside the foundry and is equipped with the usual tumbler, double emery grinder, etc. A sand blast outfit will be installed in the near future.

When the growth of the business demands it, this foundry could readily be enlarged to twice its present length and the cupola would still be within convenient distance of the far end of the building.

Machine and Erecting Shop.

The machine and erecting shop is centrally situated between the foundry and the blacksmith shop. It measures 140 ft. by 66 ft., and is divided longitudinally into three bays. The excellent natural lighting is a noteworthy feature of this section. Large window areas in all four walls, together with side lights extending the full length of the monitor roof, make this a shop that would be indeed hard to surpass as far as lighting is concerned. The result, as may be seen from the illustration of this department, is a bright, cheerful shop in which it must be a pleasure to work. Artificial lighting is by 500 watt tungsten lamps down the centre bay, in addition to which there are 100-watt lamps suspended from the crane runway between the columns. The side bays are also lighted by 100-watt lamps. This shop has a 3-inch plank floor laid on cedar ties bedded in cinders.

The centre bay is 28 feet wide and is served by a 10-ton hand operated crane built by John T. Hepburn, Toronto. Besides being used in the erection work, which is done in this bay, the crane serves the heavy lathes. The side bays are each 19 ft. wide and are occupied by the lighter tools, fitters' benches, etc. Testing, painting, etc., are done at the lower end of the shop, and there the finished hoists are loaded on to flat cars which enter the shop on the standard gauge track seen in the plan. The track entrances to this shop, and also to the boiler shop, are closed with Kinnear steel roller doors.

Some of the high-class equipment to be found in the machine shop include engine lathes by Dean, Smith & Grace; a shafting lathe taking 20 ft. between centres by the same makers; a 20-inch—50-inch gap lathe by Redman, Halifax, Eng.; Fosdick 48-inch radial drill of the latest type; No. 3 LeBlond universal milling machine; Mitts and Merrill keyseater, Redman planer, 36-in. x 36-in. x 12-ft.; 24-in. shaper and 24-in. x 24-in. x 6 ft. planer by the Canada Machinery Corporation. There are also many other lathes, drill presses, emery grinders, etc. Jib cranes, fitted with chain blocks, are attached to the shop columns at points convenient to the heavier machines. The transmission equipment is all of Dodge make, the main line shafts being 2 7-16 inches diameter. These run in 18-inch self-oiling hangers and are mounted with split wood pulleys. Adjacent to the machine shop is the general store and tool room. Here, small tools are given out on check, and the numerous jigs and fixtures are kept when not in use.

Blacksmith and Boiler Shops.

The blacksmith shop is 60 ft. x 35 ft., and has the usual cinder floor. A skylight in the flat roof supplements the windows. The work done here is not of a heavy character; so that a single 800-lb. Bertram hammer suffices for the needs of the shop. This hammer is operated by compressed air and is served by a light wall crane.

There is a handy combination punch and shear by F. Pratt & Co., Halifax, England. This is not a double-ended machine but has the punch set below the shear, so that the two throats form the shape of the figure "3." For a small shop, where both punch and shear are not likely to be wanted at the same time this makes a very handy arrangement and results in a considerable saving of floor space. There are four forges, blast for which is delivered by a 20-inch blower driven by the same motor that operates the punch and shear.

The boiler shop is adjacent to the

SECTION OF BOILER SHOP.

blacksmith department and has two bays 28 ft. and 27 ft. wide respectively, by 120 ft. long. The floor is of well tamped cinders. The wider bay is served by an 8-ton Hepburn travelling crane of simi-

SECTION OF FOUNDRY.

lar design to that in the machine shop. The head room below the crane is 19 feet. This bay is devoted to plate rolling and flanging, boilersmith work, assembling and riveting; while the other bay is used chiefly for marking off, drilling and punching. In this bay is located a two-stage belt driven 14½-9-8 Clayton air compressor, built by the International Steam Pump Co., New York. It has a capacity of 310 cubic feet of free air per minute against a pressure of 100 lbs. and is driven by a Canadian General Electric induction motor of 50 h.p.

The riveting tower, located at one end of the 28 ft. bay, is of sufficient height to allow of riveting penstocks, flumes, etc. up to 35 feet in length without turning over. The bull riveter has a gap 10 feet deep and is of the Hanna pneumatic type of 70 tons capacity.

The plate working equipment in this shop includes 10 ft. bending rolls (belt driven); Newton horizontal punch with deep throat; heavy double end punch and shear by Smith Bros. & Co., Glasgow, Scotland; 12 ft. flanging cramp, reamers, drill presses, etc., etc. Jib cranes are provided for the heavier machines. The 100-watt tungsten lamps which provide artificial light are suspended from the roof in the 27 ft. bay, while in the other they are carried by brackets attached to the wall below the crane runway.

Before leaving the works all boilers are given a hydrostatic test, after which they are kept in steam at the blowing-off pressure for several hours.

Central Heating Plant.

As previously stated, all the buildings are heated by direct radiation on the Webster system. This is accomplished from the central heating plant shown on the plan. Steam at 50 lbs. pressure is raised in a Marsh & Henthorn return tubular boiler 60 inches in diameter by 14 feet long. A reducing valve on the heating system brings this pressure down to 10 lbs. A Martin 4½-6-7 vacuum pump, controlled by a Dunham regulating valve, delivers the returns to the receiver, whence they are pumped to the boiler by a Martin duplex 3½-2¼-4 feed pump.

General Remarks.

More than fifty different patterns and sizes of hoist are made in this plant; and while the Company make hoisting machinery their leading product, they also manufacture all kinds of tanks, tip wagons, mining skips, stone crushers, vertical and horizontal boilers, locomotive type stationary boilers, with open or with water-bottoms.

The new factory will doubtless enable them to go ahead in the future even more rapidly than they have done in the past.

YEAR'S RAILWAY BUILDING.

EVERYTHING seems to indicate that the year now closing has been one of remarkable activity and progress in railway construction. Of the Canadian Northern main line between Montreal and Port Arthur no less than sixty per cent. has been completed, and on the lines belonging to the same railway which are being built through the mountains of British Columbia, construction is nearing an end. The Grand Trunk Pacific work, which now is being driven through the mountains to Prince Rupert, has made excellent progress, and the authorities of the railway look forward to the linking up of the system from the Pacific coast to Winnipeg in May or June next. The total mileage completed this year will be very heavy.

This rapid progress is remarkable, not only for its magnitude, but for the fact of its having been accomplished in a period of financial stringency. While business enterprise generally was in a more or less quiescent state, railway construction, which forms a sort of framework for the future development of the country, has been pushed forward at high speed, thus bringing closer the day when new territories will become a producing portion of the country. This activity on the part of the railways has been rendered possible by the vigorous assistance received by them from the different legislatures.

SECTION OF BOILER SHOP.

Plant Extensions, Jenckes Machine Co., Sherbrooke, P.Q.

Staff Article

This well-known firm of general engineers have two extensive plants, one at Sherbrooke, Que., and one at St. Catharines, Ont. The latter is chiefly employed in turning out boilers, while at the headquarters plant at Sherbrooke are manufactured pumps, hoisting engines, air compressors, pulp machinery, rock drills, structural steel, tanks, etc. The Sherbrooke plant has been enlarged by the addition of two new shops.

DURING the year just closing, the Jenckes Machine Co., Ltd., have put into operation two new shops, the construction of which was necessitated by the firm's increasing business. The largest of these is their new air compressor shop completed early in the year. The Company have of late considerably extended their activities in this particular branch of work and are now open to build air compressors of all sizes, centre crank or cross-compound, and for steam or belt drive. They have already got out patterns for sizes up to 1,600 cubic feet capacity and are now designing even larger units.

The new compressor shop stands on a convenient site on the west side of the Company's property, and was designed and built by themselves. It is a fine building of heavy mill construction with steel columns and roof trusses, and is 300 feet long by 110 feet wide. The walls are of concrete up to the window sills, above which level they are of red brick. The floor is of 3-inch tongued and grooved planking spiked to stringers bedded in concrete, the under side of the planks and stringers being coated with tar. The roof is also of 3-inch tongued and grooved planking, this being covered with several thicknesses of asbestos sheets with a good coating of tar between the layers.

The shop is divided longitudinally into three bays, the centre one being 50 feet wide and each of the side bays 30 feet. The main bay is equipped with two electric travelling cranes of 10 tons and 15 tons capacity. These have lattice girders built by the Jenckes Machine Co., the trolleys and electrical equipment having been supplied by Royce, Ltd., Manchester, England. This centre bay is occupied by the heavy motor-driven machine tools and is also used for assembling and testing. In the middle of the shop there is a concrete testing floor and pit. This is fitted with heavy T-slot castings levelled up and bedded in the concrete, enabling compressors to be solidly bolted down during the test. The flywheel runs in a pit which is of ample size for the largest compressors ever likely to be built. The shop is piped for compressed air and compressors being tested pump into the air line, the unloaders in the power house taking care of the excess pressure.

All the machinery in the main bay is motor driven, and is arranged down each side in such a way that every machine can be served by the overhead cranes. The equipment is all high-class, and it is evident that no expense has been spared to ensure a high-grade output. The heavy tools include a very fine Landis grinder for straight and taper work. This machine has a capacity for work of 20 inches diameter by 10 ft. long, and is driven by a 25 h.p. Allis-Chalmers 3-phase, 550 volt, 60-cycle motor. On this grinder, crank pins, Corliss valves, main shafts, etc., are finished. Near this machine there is a 24-inch slab miller by the Canada Machinery Corporation. This is only one of a large number of C. M. C. tools in the shop. Other machines in this bay are a 48-inch Mueller radial drill with change speed gear box, and 48-inch and 72-inch C. M. C. radials driven by variable speed motors. There is also a 36-inch by 16-foot Detrick and Harvey open sided planer.

On the opposite side of the main bay there are a number of boring mills and engine lathes, all of the heavy duty type. The engine lathes are all by the Canada Machinery Corporation and are driven by Reliance variable speed motors of the shifting armature type mounted directly on the head of the lathe, There are four of these lathes, two being 18-inch x 8 ft., one 20-inch by 10 ft., and

NEW COMPRESSOR SHOP LOOKING SOUTH.

one 42-inch by 14 ft. The latter is a heavy forge lathe having tailstock fitted with an independent boring head driven by a separate motor. The main driving motor on the headstock has a small auxiliary motor for shifting the armature when changing speed.

Other equipment of a heavy character includes a C.M.C. 24-inch Dill-type slotter, C.M.C. and Detrick and Harvey horizontal boring mills, 42-inch Bullard vertical turret lathe, 72-inch boring mill by H. Bickford & Co., Lakeport, N.H., two Jones and Lamson turret lathes, Ford-Smith heavy wet tool grinder, etc. There is plenty of room still available for further equipment, the shop having been specially designed with a view to future requirements.

In the middle of the east bay a space is screened off to form a tool room where are located a Brown & Sharpe No. 2 universal miller, Pratt and Whitney tool-room lathe, Washburn drill grinder, etc. A large amount of the work in the shop is jigged; especially the various have thoroughly up-to-date hardening and annealing furnaces. Very careful attention is given to the hardening and heat treatment of the various wearing parts of compressors and rock drills. Outlet valves of the poppet type are made from $3\frac{1}{2}$ per cent. nickel steel and are finished by grinding.

The west bay of the shop is at present chiefly used for storage of castings and for testing rock drills, each drill being thoroughly tried out under 120 lbs. air pressure before being shipped. This

NEW COMPRESSOR SHOP, LOOKING NORTH.

96-inch ditto by the Canada Machinery Corporation, etc.

The lighter machines are all of equally high-class, and are located in the east bay, which is 30 feet in width. They are all belt driven from line shafts running in Chapman double ball bearings, and include, amongst others, a No. 3 Brown & Sharpe plain miller, Landis No. 3 universal grinder, a 4-spindle ball bearing sensitive drill by N. G. Barr & Co., 28-inch Barnes drill press, C.M.C. 24-inch shaper, C.M.C. 24-inch planer, parts of the firm's well-known line of rock drills. It is, of course, very essential that all spare parts for these shall be absolutely interchangeable to enable repairs to be readily made by unskilled labor. A large business is done in these rock drills and quite a number of men are kept constantly employed on this class of work.

From the east bay there runs out an annex measuring 60 ft. x 40 ft. This is now being fitted out as a blacksmith shop and carbonizing department, and will side of the shop allows ample space for further machine tool equipment, when the natural growth of the business demands it.

The artificial lighting of the compressor shop is by 100-watt tungsten lamps suspended from the crane runway between the columns, which are spaced at 20 feet centres. Heating is by direct radiation on the vacuum principle, the coils being arranged along the walls below the windows. Further coils are carried by the roof in the side bays, but

NEW COMPRESSOR SHOP LOOKING TOWARDS EAST BAY.

are not often used, the main coils in the walls being generally sufficient to maintain a comfortable temperature. This installation was put in by the General Fire Extinguisher Co., Providence, R.I.

A standard gauge track runs across the floor near the north end, and, on this, castings, etc., are brought in and finished products shipped out. This new shop has greatly increased the Jenckes Machine Co. output, and is a credit to them in every way. The machine tool equipment is especially fine.

The Structural Shop.

The structural shop is the second addition to the plant made in 1913 and is a steel framed building with concrete curtain walls. The building measures 300 ft. by 60 ft. and is covered by a single span roof. On a runway 22 feet above floor level there are two cranes of 10 tons and 15 tons capacity of similar type and make to those in the compressor shop. Large window areas placed high up in the walls and running the full length of the shop give good lighting in all parts of the shop, arc and tungsten lamps being used after dark. The floor is of tamped cinders and is served by a standard gauge track which enters the shop at its upper end. Large doors in the side walls allow teams to enter when necessary.

The work done here consists chiefly of fabricating structural steel, large tank work and heavy plate work; and, as in the compressor shop, the equipment is of a high order. At the lower end of the shop is located the rivetting tower which is equipped with a hydraulic crane and is of sufficient height to allow of rivetting up large pipes or penstocks 30 feet in length. The hydraulic pressure used throughout the shop is 1,500 lbs. per sq. inch and is obtained by an accumulator having a ram 10 inches diameter by 12 feet stroke. This is operated by a Deane 3-in. x 10-in. two-throw motor driven pump. The large bull riveter has a gap of 12 feet and was built by R. D. Wood & Co., Philadelphia. It is of the triple power, outside packed type of 25, 50 and 100 tons capacity. Nearby is a fine 100-ton hydraulic sectional flanging press also by R. D. Wood & Co. This is served by a 9 ft. 6 in. x 6 ft. coal fired furnace.

Other tools to be found here include a heavy double end Cleveland punch and shear with 60-inch throats, two Pells all-steel punch presses of German make, motor-driven horizontal punch, Hanna heavy portable air riveters and the usual equipment of pneumatic tools. The building is heated by the Sturtevant hot blast system, the coils and fan being located above the furnace serving the flanging press.

This shop has already resulted in a largely increased output, and can be readily extended lengthways when the growth of the business renders such step necessary.

NEW COMPRESSOR SHOP TESTING FLOOR.

THE GRAY MFG. AND MACHINE COMPANY.

ONE of the more recent additions to the list of manufacturers of machinery in Toronto is the Gray Mfg. and Machine Co., who started operations at their new plant in January, 1913. A site was purchased on St. Clarens Ave., and a machine shop 80 x 40 ft. built for manufacturing foundry equipment such as swing and stand grinders, polishing machines, power and steam pumps, etc. The shop is well equipped for carrying on a general engineering business, and the company realizing that, in order to maintain high class production the best tools are necessary, have one of the most modernly equipped shops, for its size, in the city. The machine tools are capable of the wide range of work necessary in this kind of business, and consist of a No. 4 "Cincinnati" milling machine, a universal tool grinder supplied by the same Company—the Cincinnati Milling Machine Co.; a 4 ft. "American" radial drill and several engine lathes by the Hendey Machine Co. There are also several grinders and a 54 in., 14 ft. low bed "Butler" lathe.

The line shaft is driven by a 15 h.p. Can. Westinghouse motor using hydro power at 220 volts. The shop is lit by "Mazda" lamps, and is heated by steam from a 15 h.p. vertical boiler. Four runways operate across the shop, each being equipped with a $1\frac{1}{2}$ ton "Gray" chain block. There are two jib cranes also fitted with the same chain blocks. At the front of the building are the offices and stores, and at the rear in a separate structure is a blacksmith shop. In the yard is a storage for steel bars, plates, etc.

The company at the present time employ about 20 men and we understand that they are well satisfied with the amount of business done this year. There is sufficient room on the property to double the size of the present plant. The officers are Alex. Gray, president; Robert Gray, vice-president., and James Gray, general manager. Close supervision is given by each member of the firm to all work in progress which ensures high class output.

The Chapman Ball Bearing Co., Toronto, have opened up agencies in a number of American cities, and are doing a remunerative export business through this instrumentality, despite the 35 per cent. duty.

INDUSTRIAL DEVELOPMENT

GOVERNMENT TO REFINE ORE.

THE Canadian Government has found it necessary to enlarge its refining facilities considerably, and to abandon the proposal to build an extension to the present Mint, for which a sum of $50,000 was voted at last session of Parliament. During the next session a comprehensive proopsal will be laid before the House by Hon. W. T. White.

The policy of the Government is to build such a plant as will be capable of refining as much as possible of Canadian ore. Canada is one of the greatest silver-producing countries in the world, but the ore is refined chiefly in the United States. To build up a home industry is the intention.

Since the mint was opened for business in 1908, silver coinage to the value of $5,710,944 has been produced, composed as follows: Fifty-cent pieces, $751,285; twenty-five cent, $2,586,190; ten-cent, $1,393,582; five-cent, $979,880. In addition to these, a quarter of a million dollars worth of one-cent bronze pieces were minted, $1,500,000 worth of gold sovereigns for the British Government, and Canadian gold pieces to the value of nearly two million dollars.

B. F. STURTEVANT CO. OF CANADA, LIMITED.

ONE of the largest manufacturers from across the border locating in Canada this year is the B. F. Sturtevant Co., of Boston, Mass., who have been incorporated as the B. F. Sturtevant Co., of Canada, Ltd., and have established a new plant at Galt, Ont. The company are at present only manufacturing heating and ventilating systems for the Canadian market, but the products will eventually be identical to those being manufactured at the Boston plant. The company have secured an option on ten acres and are occupying temporarily a brick building, 175x60 ft. It is highly probable that important developments will materialize in the spring and a start be made on a large plant to take care of the increasing demand for the company's products in this market.

The building is well equipped for making steel plate fans, heaters and blowers, and arrangements are being made to manufacture vacuum cleaners. Machinery suitable for this class of work has been installed and includes lathes, gate shears, drills, grinders and pipe threading machines. A 50 H.P. motor drives the line shaft and a steam-driven air compressor supplies compressed air for various purposes. In the rear of the main building is a blacksmiths' shop and a general storage, while at the front are the offices.

The plant at Galt is under the management of Mr. B. M. Chittick, who reports that business has been very satisfactory and that prospects for the future look bright. A head sales office has been opened in Montreal and branch offices will be established in the more important cities in due course.

HYDRO-ELECTRIC RATES.

THE undernoted reductions in Hydro-Electric rates per horse per year went into effect on November 1 for the different municipalities named in the Province of Ontario:—

Hamilton	$16.00	to	$15.00
Dundas	16.00	to	15.00
Caledonia	29.10	to	24.00
London	24.00	to	23.00
Guelph	22.00	to	21.00
Preston	21.50	to	21.00
Galt	22.00	to	21.50
Waterloo	23.50	to	22.50
Berlin	22.50	to	21.50
Baden	37.00	to	32.00
St. Thomas	29.00	to	28.00
Port Credit	31.00	to	28.00

ONTARIO PAPER CO. MILL, THOROLD, ONT.

AMONG the numerous new mills in course of construction along the route of the new Welland Canal, that of the Ontario Paper Co. is one of the largest, and, at the same time, the most interesting, from an electrical standpoint. The electrical power is supplied to the mill from the Ontario Power Co. power house at a pressure of 12,000 volts through two overhead aluminum lines, together with two auxiliary copper lines. The transmission lines enter the mill through a switching station. The lightning arresters are of the General Electric electrolytic type. The switching station contains step-down transformers for fire pump service.

From the switching station the current is taken in underground conductors laid in steel conduit to the motor room and connected to the 12,000 volt bus bars through two motor controlled G.E. oil switches. The bus structure is of concrete and brick, and is situated directly under the switchboard gallery; all oil switches are located on the switchboard gallery.

The motor room contains five 2,000 h.p., 12,000 volt, 25 cycle induction motors built by the General Electric Co. of Sweden, running at 246 r.p.m. These motors are direct connected by flexible couplings to the pulp grinders, each line of grinders having four stones and each stone three pockets.

The main switches on the 2,000 h.p. motors are electrically operated from the motor room floor. The starting rheostats are of the iron grid type. When starting up after the motors have reached synchronous speed, the slip rings are short circuited, and the brushes raised by means of a switch on the motor shaft. This switch is arranged so that it is impossible to close the main switch until the short circuiting switch is in the starting position. All stock pumps, etc., are driven by Crocker-Wheeler 600 volt induction motors. The two Jordan machines are driven by two 150 h.p. auto-synchronous Swedish General Electric motors.

There are at present installed two 204 inch paper machines, said to be the largest in the world, each machine running at the rate of 600 feet per minute, wit ha capacity of 60 tons of paper per day. The paper machines are driven by two Terry steam turbines of 500 h.p. each, running at 1,500 r.p.m.

THE KELSEY WHEEL CO.

THE Kelsey Wheel Co., Ltd., is the latest concern to start operations in the factory district of Windsor, Ont. The property covers an area of 4¼ acres facing MacDougall Avenue and adjoining the Essex Terminal Railway tracks where the company have 1,000 feet of siding, part of which is alongside the shipping platform. The buildings are of modern mill construction and were designed and erected by Wells & Gray, contractors, Toronto. The windows throughout the plant are fitted with "Kahn" steel sash and ribbed glass, all the buildings having exceptionally bright interiors. All heating is by steam, coils being arranged around the walls. The heating system was designed and installed by the Pittlekow Engineering Co., Detroit, while the electric light system was installed by the company. The plumbing contract was carried out by Pennington & Bryan, Windsor, who also installed the lavatories and sanitary drinking fountains provided in each shop. All the buildings are equipped with an automatic sprinkler system which was installed by the Automatic Sprinkler Co., of America, Detroit, Mich. In connection with this system, there is a 40,000 gallon tank on the roof.

The main building is 360 x 60 ft., two storeys high, while provision has been made for the addition of two more storeys when required. It lies parallel to the road on the west side of the plant, and is devoted almost entirely to finishing and trimming automobile bodies. On the ground floor, at the north end, are the offices, the curled hair storage being at the south end. The rest of the floor is used for preliminary painting the car bodies. On the floor above are the trimming and final painting departments. In the former, the bodies are upholstered, two-hand power "Tutting" back presses being used for the purpose. Power machines will be installed later. The final painting is done in an air tight, dustproof room. The bodies are then put in a drying room from which all light is excluded, the temperature kept moderately high. There are two drying rooms specially fitted for this purpose. In this building are two 3-ton electric freight elevators which were supplied by the Roelofson Elevator Co., Galt. They are equipped with solenoid brakes, safety devices and slack cable mechanism. The car bodies pass through 24 operations before being completed.

PLANT OF THE KELSEY WHEEL CO., WINDSOR, ONT.

Wheel Shop.

The wheels are manufactured in a building on the east side of the plant and parallel to the main building. The wheel shop is a brick building, 300x50 ft., one storey high, with provision made for the addition of two more floors when necessary. At the north-east side are two dry kilns for drying the spokes. The kilns are 40x20 ft. and are heated by steam through the medium of pipes which are laid around the walls and under the floor. The north end of the shop is devoted to the wood-working process, that is, finishing the spokes. The south end is equipped with special tools for finishing the hubs and rims. The machinery for this department was made by the company at their Detroit plant. The woodworking machinery is specially adapted for the work and was supplied by the Defiance Machine Works, Defiance, O. In manufacturing, the parts are worked towards the centre of the shop from their respective departments, where they are assembled and taken to the shipping room adjoining the shop and on the railway siding.

The line shafting is motor-driven and equipped with roller bearings supplied by the Hyatt Roller Bearing Co., Harrison, N.J. The pulleys were supplied by the American Pulley Co., Philadelphia.

Power House.

The power house is located at the northern end of the plant and is 50x50 ft. The building is divided into two sections comprising the boiler and engine room respectively. In the boiler room is a 250 h.p. Goldie & McCulloch water tube sectional boiler with 2,500 sq. ft. of heating surface and a working steam pressure of 150 pounds. It is fitted with hand fired grates having 50 sq. ft. of grate surface. A steel stack 90 ft. high was also supplied by Goldie & McCulloch.

The engine room contains a 200 h.p. Hamilton Corliss engine which was supplied by the Hooven, Owens & Rentschler Co., Hamilton, Ohio. The engine cylinder is 16-in. diameter by 30-in. stroke and is direct connected to a Canadian Westinghouse revolving field alternator.

The company is associated with the Kelsey Wheel Co., Detroit, and the officers are John Kelsey, president; W. H. Ducharme, vice-president; M. G. Campbell, secretary and general manager and B. T. Fox, treasurer.

THE CANADIAN WINKLEY CO.

THREE years ago the Canadian Winkley Co. located at Windsor, Ont. Later a factory was built, and in December, 1911, operations were commenced. The building, 100 ft. square and of concrete construction, is equipped for the manufacture of a complete line of oiling devices, such as plain and ratchet compression grease cups, oil hole covers, oil cups, brass dowels, etc. This Company is a branch of the Winkley Co., Detroit, Mich., and manufactures the same lines. They do a large business with automobile manufacturers, in addition to that with other industries.

A large part of the building is devoted to the machine shop, but there are also an assembling room, shipping and store room, tool room, nickel plating and dipping departments, and offices. The machinery installed consists mainly of punches and presses, lathes and automatic machines. The grease cups are made from either steel or brass sheets. Blanks are punched from the stock, then put in a press which makes them the desired shape. They are next threaded in a Warner & Swasey turret lathe, following which the hole is punched in a press. The caps are pressed to shape from blanks, and then threaded and knurled. The brass dowel pins are made in a Hartford automatic screw machine, and the oil hole covers in an automatic machine, which will perform ten operations. Four bars can be fed at one time. This machine was supplied by the National-Acme Mfg. Co., Cleveland, O. The line shaft is driven direct from a 40 h.p. "St. Mary's" gas engine using natural gas, and the shop is heated by steam from a boiler fired with natural gas, the latter being also used for lighting the shop.

This Company is one of several who have located in the Windsor district in recent years, and we understand that the management are well satisfied with the results obtained, and with the outlook for future business. About fifty men are employed at present, which is sufficient to take care of a large output.

DODGE MFG. CO., TORONTO, GET LARGE ORDER.

THE Dodge Mfg. Co., Toronto, have received an order for over 300 tons of machinery for the Saskatoon elevator being built by the Dominion Grain Commissioners. The Dodge Co. are the only concern in Canada who have equipped themselves with the necessary plant and machinery for the execution of this class of contract, and, as a consequence, they are kept busy on large jobs for the many terminal elevators which have been recently constructed by the railways and the Government. They have just completed a large job for the Canadian Pacific Railway Co. of St. John, N.B.

TATE ELECTRICS, LTD.

WALKERVILLE, Ont., is the centre of the automobile industry of Canada, and the number of firms engaged in this business has been increased by the Tate Electrics, Ltd., who started manufacturing at their new plant on July 1st, 1913. The Company purchased five acres and built a two-storey brick building, 320 x 60 ft., for the manufacture of electric pleasure and commercial cars. The former include roadsters and coupees to carry from two to five passengers, while the commercial cars range from 500 pound to 5 tons capacity. The Company make their own storage batteries and motor equipment, and have installed the latest machinery for car making. The ground floor is devoted to manufacturing and assembling the cars, and on the first floor the car bodies are made. About 100 men are employed and 7 cars are turned out each week.

NORTH-WESTERN BRASS CO., LTD.

AMONG the most up-to-date brass foundries erected this year is that of the North-Western Brass Co., Ltd., located near the roundhouses, East Calgary, Alta., operations in which commenced during November. This is one of a chain of brass foundries to be erected by this Company which was recently incorporated at Ottawa.

The Calgary foundry, measuring 200 feet by 100, with a garage for the Company's trucks, 40 feet by 70 at the south end, is constructed throughout of reinforced concrete, the only wood in the building being the hardwood finishing in the office, which is situated in the northeast corner of the structure.

Starting at the south end of the building, the foundry is planned on what might be called the progressive system. First comes the metal room, with its 23 metal bins, each of 40,000 lbs. capacity; next the foundry proper, 80 feet by 100, on the left side of which are the battery of twenty furnaces, where the melting is done by means of coke, which comes in on the twenty-car track running along the west side of the building. By this track also are placed the sand storehouses. Sand comes from St. Paul, Minn.

With the same purpose of economy and efficiency, the pattern room, core ovens, the machine tools, the assembly and shipping departments are planned.

Provision for the comfort of the employees is made by a large wash room, lavatories and steel lockers below the offices of the foundry. Good working conditions are still furthered by the exceptionally large proportion of wall space in all departments, which is taken up by the large steel-sashed windows.

The foundry and equipment in running order means an investment of $250,000. Fifty men are being employed to begin with, to be increased to one hundred as business demands. The Company, whose headquarters are in New York, have foundries at Winnipeg and St. Thomas. A. G. Meaden is the manager of the Calgary branch, with H. W. Tritt in charge of the office.

CANADIAN DETROIT LUBRICATOR CO., LTD.

THE Canadian Detroit Lubricator Co., Ltd., have been located in Canada over three years. The plant at Walkerville, Ont., has, however, only been in operation about twelve months. The Company purchased an acre of land on the Walker Road, and built a concrete and brick building, 175 x 50 ft., for the manufacture of "Detroit" lubricators, hydrostatic lubricators, forced feed oilers, packless valves, carburettors, etc. At one end of the building is the brass foundry, 50 x 50 ft., where are six furnaces for melting brass, also a number of moulding machines and core ovens. In another part of the building is the brass finishing department, in which several brass finishing tools are installed. At one end of this are the offices and store room. The machines are driven from a line shaft, which in turn is driven by a motor, current for power and lighting being obtained from the Walkerville Light and Power Co. The Company is associated with the Detroit Lubricator Co., Detroit.

CANADIAN-DETROIT LUBRICATOR CO. PLANT AT WALKERVILLE, ONT.

TORONTO STRUCTURAL STEEL CO.

THE coming year will see in operation the new plant of The Toronto Structural Steel Co. The town of Weston, within a few miles of Toronto, is an ideal location for this large and growing industry. Because of its high elevation, congenial surroundings, and its prospects for rapid mercantile and industrial development, it also offers exceptional advantages to the large number of men who will be employed in this plant, and this was one of the considerations which entered into the selection of this site.

The company own a tract of land on the northern side of the town, consisting of twenty acres adjacent to the Canadian Pacific and Grand Trunk Railways. On this property they have erected a shop, 442 feet long, by 130 feet wide. The building is of steel construction throughout, and of the depressed bay type. Continuous steel sash on all sides gives adequate light. The outer walls are of brick and cement plaster, making a very permanent and pleasing effect. The building is floored with "Tar-Roc;" the templet shop having laid thereon a maple floor. The whole interior is painted white. The structure has been designed in such a way as to permit of its being duplicated on the western side, or of giving a total floor space of 442 x 260 ft., the main floor 442 x 160 ft. being broken only by four columns.

Equipment Features.

The stock and receiving yard is located at the north end and at right angles to the building. It is served by a 10-ton, 70-ft. Northern Engineering Co. crane, the runway for which is 405 feet long. The railway siding owned by the company is extended parallel to and of the full length of the shop into the stock yard. The whole lay-out permits of economical handling and storing of raw materials. In the stock yard and close to the main building are located a "Bertram" bending and straightening machine, and a Ryerson friction saw, the latter being equipped with power feed rolls for handling material.

In the north end of the shop a large space is provided for the laying out skids. Here are to be found a convenient arrangement of beam punch, two 24-inch high speed punches and double-angle shear on a revolving bed, a 60-inch plate shear, also on a revolving bed and a multiple punch, the latter being equipped with a Conley spacing table. All of the above machines are of Bertram, Dundas, make. A "Weiner" revolving coping machine is also installed. A large rotary planer is located at the south end of the shop, while a special portable reaming machine travels on a standard gauge track the full length of the fitting-up section. All machines are individual alternating current motor-driven. In addition to the foregoing, there are five Hanna pneumatic riveters.

The shop is served inside by nine, 2 and 5-ton electric cranes, traveling on the lower chords of the roof trusses. These are of 20 and 32 feet spans. Two narrow gauge tracks, one on each side, run the full length of the shop, and two 10-ton Wilson scales intersect these tracks at the south or shipping end, and have their beams located in the shipping office.

The templet shop, lavatories, locker rooms, power house, boiler house, machine and forge shops are located in the lean-to on the east side of the building, which forms part thereof. These shops are divided from the main building by 14-inch brick walls. The templet shop is equipped with band-saw, pony planer, and boring machines.

Every consideration for the convenience and comfort of the employees has been given. The sanitary arrangements are of the most modern and approved type. Sanitary drinking fountains are placed at convenient points throughout the shop, while adequate wash basins with hot and cold water are provided. Individual lockers will also be available.

Power Plant.

In the power house, an 82-K.W. motor generator set, of The Lancashire Dynamo Co. make, generates direct current for the crane motors. A two-stage Bury air compressor with arrangements for belt and steam drive is also located here. A 130-H.P. Canadian General Electric Co. motor will drive this machine in summer, while a Babcock & Wilcox 200-H.P. boiler will provide for steam drive in winter, as well as supplying the Canadian Buffalo Forge Co. fan system, with which the building will be heated.

The machine shop, with its lathe, shaper, radial drill, bolt-cutting and threading machines, will take care of all repair work, and any additional special equipment that may be required. The forge shop is equipped with a motor-driven Fairbanks power hammer, and with its heating furnaces and forges will take care of a wide range of work necessary in every structural shop.

The shipping yard, located at the south end of the main building, has a 15-ton, 80-ft span Northern Engineering Co. crane, the runway of which is 250 feet long. This yard is also served with a railway siding, which is extended into the main shops.

The combined plants of the company will have an annual capacity of about 22,000 tons, and with the large and complete stock of steel being carried at both the Toronto and Weston plants, prompt shipments are assured.

THE BROWN, BOGGS CO., LTD., HAMILTON, ONT.

WITH the growth of Canada the demand for tinsmiths' tools and machinery and for sheet metal working machinery has grown commensurately, and the Brown, Boggs Co., Ltd., of Hamilton, Ont., being pioneers in this class of work, have found the demand for their machinery to be so great that they have been compelled to build a new plant. Hamilton, too, is in the Niagara fruit growing district, and of late canning factories have been growing up like mushrooms in Ontario. The Brown, Boggs Co. have been supplying the canning and evaporating machinery required for this industry, and not only do they cater to the trade in Canada, but they do considerable export business. The demand for tinsmiths' machinery comes from South America, and various lines are exported to Chili, British Guiana, Brazil, South Africa, Holland, England, China, New Zealand, and Australia.

The Company was originally organized for the manufacture of tinsmiths' tools and machinery, and consisted of J. M. Brown, N. G. Boggs, W. E. Blandford, and James Anderson. Gradually the firm extended into other lines, and eventually bought out the late S. J. Moore, manufacturers of tinsmiths' and sheet metal working machinery, who were situated at the corner of King William Street and Victoria Avenue, Hamilton. This plant, although added to year by year, until now it covers half a block, recently became inadequate for the firm's growing needs, and, being unable to extend further in that section of the city, a site of eight acres was purchased on the west side of Sherman Avenue, north of the G. T. R. tracks, served also by the C. P. R. and the T., H. and B. Railway. The Company was very fortunate in securing this site, it being one of the most valuable locations in the big factory district which has grown up in Hamilton.

On this ground the Brown, Boggs Co. are erecting a modern plant, designed so as to permit further extensions to cover the whole site when business warrants it. The work is in the hands of Prack & Perrine, architects and engineers, Hamilton and Toronto, who have had charge of many of the largest engineering jobs of this kind in Canada. The plant will consist of machine shop, foundry, pattern shop, pattern storage, blacksmith shop, power house, offices and warehouse. Up to the present only the foundry, the pattern shop and the pattern storage have been completed.

FOUNDRY INTERIOR, THE BROWN BOGGS CO., HAMILTON.

Pattern Shop and Pattern Storage.

The two last departments are housed one three-storey building, with a reinforced concrete frame filled in with brick curtain walls, and with steel sash. The ground and second floors are used for pattern storage, and the third floor for a patternmaking department. An

industrial track connects the building with the foundry, so that large patterns may be easily transferred. The three floors are also connected by an electric elevator. The building is protected by means of a sprinkler system and stand pipe with hose attachment, and has been designed so that should a sprinkler head blow off on one floor the water will be allowed to leave that floor through gulches, without flooding the floors beneath.

Practically the whole of the first two floors are equipped with wire shelves for holding small patterns, though much space is allowed on the ground floor to accommodate the larger patterns. The machinery in the patternmaking shop is run from line shafting, and consists of a 36-inch bandsaw, made by the Preston Woodworking Co., Preston, Ont.; a No. 6E trimmer, by the Fox Machine Co., Grand Rapids, Mich.; a planer and a lathe. There is also a pattern lettering machine. Power is supplied by a Canadian Westinghouse motor. The room is liberally supplied with benches for both wood and metal patternmakers.

The third floor is heated by two down-draft stoves, supplied by the Fuel Economizer Co., Hamilton, seven of which have been installed in the foundry. These stoves are remarkable for the small amount of fuel they consume. Sanitary drinking fountains have been installed on the three floors, and will be used all over the plant. On the third floor there is also a washroom and lavatory for the men.

The Foundry.

Every effort is being made to run the foundry on modern lines. It is in charge of T. A. Brown, vice-president and superintendent. The work consists of small and heavy moulding, considerable work being done for outside firms who demand a superior grade of castings. The construction is of steel, concrete and brick, steel sash and heavy factory glass, so designed as to require as little artificial light as possible. The roof is of asphalt and gravel.

The middle high bay is used exclusively for heavy castings. It is 35 feet wide, and is served by a 16-ton electric crane, made by John T. Hepburn, Toronto. The low bay is 25 feet wide, and is used for light work. A hand crane will serve the whole length of this bay. The other side of the foundry, which is 20 feet wide, is occupied by the core and cupola rooms. The industrial track from the pattern storage runs the whole length of the foundry between the high and low bays. At the west end is a door leading to the yard, where flasks are stored, and at the eastern entrance is a turntable connecting with another track running north to the machine shop and assembling rooms. This track also connects with the cleaning department, which is situated at the eastern end of the low bay.

Cupola Building.

The cupola building has three floors, connection with which is made by stairs or an electric elevator supplied by the Otis-Fensom Co., Hamilton. At present only one cupola has been installed, although room has been left for another of smaller capacity. The cupola has a capacity of 90 tons an hour when going full, and is the product of Sheldon's, Limited, Galt.

The industrial track connects the supply house with the elevator. Fuel and iron is weighed on a set of Gurney scales before being carried up to the charging floor. The latter is constructed of cast iron over reinforced concrete. It is proposed to build a track here, so that cars may be run direct from the elevator to the cupola. Byram & Co., Detroit, supplied the cars, and the Canadian Westinghouse Co. the motor for driving the elevator.

On the floor beneath the blower supplying the blast is installed, also an Ingersoll-Rand air compressor, providing air at 100 lbs. pressure to the moulding machines, air hammers, and sand sifters. The blower is a No. 5, supplied by the P. H. & F. M. Root Co., Connersville, Ind. On the ground floor are situated the washrooms and lavatories.

The Core Room.

Adjacent to this building is the core room. There are two core ovens—a large and a small one. The latter is fired by coke from a pit in the cupola room. It measures about 12 x 7 x 7, and is provided with a track for taking big work. The walls carry shelves for holding small cores. The other core oven is a small portable one, coke fired, which, when opened, does not allow the heat to escape. It has four compartments. This was supplied by the Wadsworth Core Machine and Equipment Co., Akron, O., and the large one by Frederick B. Stevens, Detroit and Windsor. The former Company also supplied a small coremaking machine. Another will shortly be installed for tapering the ends of large cylindrical cores. Near the coremaking department is the superintendent's office.

Cleaning Department.

The cleaning department on the opposite side of the building has been equipped with two tumblers for cleaning small castings, connected with a dust arrester, which is situated outside the building, the dust being drawn from the tumblers by means of a blower supplied by the Buffalo Forge Co., Montreal. Motive power is secured from a 10 h.p. Canadian Westinghouse motor. There is also a grinder in this department, supplied by the Ford-Smith Machine Co., Hamilton. The tumblers were installed by the General Supply Co., Toronto. Other equipment consists of Ingersoll-Rand chipping hammers.

For medium-sized work, the Brown, Boggs Co. use moulding machines, supplied by the Berkshire Mfg. Co., Cleveland, O. It is their intention to instal several more, and they are also considering the purchase of some sand rammers for floor work. Castings can be made on the main floor up to 15 tons.

Artificial light is supplied by the Hydro-Electric Commission. Seven Nulite lamps, 60 to 250 c.p., are suspended on each side of the high bay, while smaller lamps provide light for the low bay and the cupola and core rooms. The time clock was supplied by the International Time Recording Co.

Machine Shop.

A start on the other buildings has not yet been made. The machine shop will consist of two sections, a high bay for heavy work, and the rest divided into storeys. The first storey will be used for medium work, the second for light work, and the third for storage. The two top floors will be direct connected with the warehouse by a bridge, so that a truck may be run across. The high bay will be used principally for assembling, and will be served by a powerful electric crane, allowing 25 feet clear between the crane and the machine shop floor. Electrically operated jib cranes will be used in the low bay. Industrial tracks will connect the machine shop with the foundry and all other departments. The machine shop will be laid out to allow of the continuous progress of the parts.

The boiler house will provide heat for the buildings, and power may be generated if found necessary. Two boilers will be installed at present, with provision for a third.

Blacksmith Shop.

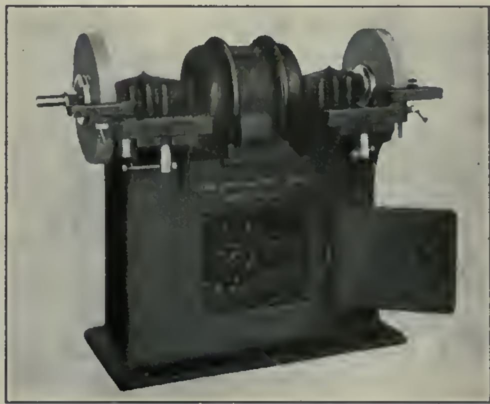
The blacksmith shop will be a one-storey building of steel, brick and concrete construction, containing forges, drop hammers, and other equipment necessary for light and medium forge work. The warehouse will be a four-storey building, direct connected with the machine shop by bridges, and will be used for storage and assembling smaller work. It will be of reinforced concrete throughout, with steel sash, and equipped with an elevator. The office will be a four-storey building, with basement, of reinforced concrete, brick, and steel sash. Accommodation

(Continued on page 180).

Quality Grinders

Standard and Special Grinding Machines, Belt or Motor Drive, Swing Grinders, Safety Flanges, Guards, etc.

Heavy Grinders



We manufacture a full line of higher grade grinding and polishing machines for all purposes, Belt or Motor Drive, for wheels from 6 to 30 in. diam. They are of convenient design, heavily and proportionately built and the workmanship and finishing are unusually high. Ford-Smith Grinder Equipment is becoming standard where quality service counts.

Stock Deliveries

It will joy you to get our prices on anything in our line from a 10-lb. Bench Grinder to 2,500 fully equipped, self-contained Motor Drive Machine.

The Ford-Smith Machine Co.

HAMILTON, ONT.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

	Mont'l.	Tor'to.
Grey Forge, Pittsburg.	.....	$14 15
Lake Superior, charcoal, Chicago	.....	15 25
Middlesboro, No. 3	20 00	21 50
Carron, special	24 25	.....
Carron, soft	24.25	.....
Cleveland, No. 3	20 00	22 00
Clarence, No. 3	20 50	21 00
Jarrow	.....	23 50
Glengarnock	......	26 00
Michigan charcoal iron.	25 00	.....
Ferro Nickel pig iron (Soo)	.....	25 00
Victoria, No. 1	19 40	18 35
Victoria, No. 2X	19 15	18 10
Victoria No. 2 Plain	18 90	17 85

BILLETS.

	Per Gross Ton.
Bessemer billets, Pittsburgh	$20 00
Open hearth billets, Pittsburgh	20 00
Forging billets, Pittsburgh	24 00
Wire rods, Pittsburgh	25 50

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto	2.00
Steel bars, f.o.b., Toronto	2.05
Common bar iron, f.o.b., Montreal.	2.05
Steel bars, f.o.b., Montreal	2.10
Bessemer rails, heavy, at mill	1.25
Steel bars, Pittsburgh	1.20
Tank plates, Pittsburgh	1.20
Beams and angles, Pittsburgh	1.25
Steel hoops, Pittsburgh	1.40
F.O.B., Toronto Warehouse.	**Cents.**
Steel bars	2.20
Small shapes	2.30
Warehouse, Freight and Duty to Pay.	**Cents..**
Steel bars	1.70
Structural shapes	1.80
Plates	1.80

Freight, Pittsburgh to Toronto.
18 cents carload; 21 cents less carload.

IRON PIPE FITTINGS.

Canadian malleable, 40 per cent.; cast iron, 65; standard bushings, 70; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 77½; malleable, lipped unions, 65.

NAIL AND SPIKES.

Standard steel wire nails, base..	$2 30	
Cut nails	$2 60	2 65
Miscellaneous wire nails...	75 per cent.	
Pressed spikes, ⅝ diam., 100 lbs.	2 85	

BOILER PLATES.

	Mont'l.	Tor'to.
Plates, ¼ in., 100 lbs...	$2 30	$2 20
Heads, per 100 lbs.	2 55	2 55
Tank plates, 3-16 in.	2 60	2 30
Tubes, per 100 ft., 1 inch	9 50	8 50
" " 1¼ in.	9 50	8 50
" " 1½ "	9 50	9 00
" " 1¾ "	9 50	9 00
" " 2 "	9 00	8 75
" " 2½ "	11 15	11 50
" " 3 "	12 10	12 50
" " 3½ "	14 15	14 50
" " 4 "	18 00	18 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Stove bolts	80 & 7½
Machine bolts, ⅜ and less	65 & 10
Machine bolts, 7-16	60
Blank bolts	60
Bolt ends	60
Machine screws, iron, brass	35 p.c.
Nuts, square, all sizes....	4¼ per lb off
Nuts, Hexagon, all sizes..	4½ per lb off
Fillister head	25 per cent.
Iron rivets	60, 10 p.c. off
Wood screws, flathead, bright	85, 10, 7½, 10 p.c. off
Wood screws, flathead, Brass	75, 10, 7½, 10 p.c. off
Wood screws, flathead, bronze	70, 10, 7½, 10 p.c. off

Milled Products.

Sq. & Hex. Head Cap Screws	65 & 10%
Sq. & Hex. Head Cap Screws	65 & 10%
Rd. & Fil. Head Cap Screws	45-10-10%
Flat & But. Head Cap Screws	40-10-10%
Finished Nuts up to 1 in...	75%
Finished Nuts over 1 in....	72%
Semi-Fin. Nuts up to 1 in..	72%
Semi-Fin. Nuts over 1 in...	72%
Studs	65%

Discounts, f.o.b., Montreal.

OLD MATERIAL.

Dealers' Buying Prices.	Mont'l.	Tor'to.
Copper, light	$10 00	$11 00
Copper, crucible	12 00	12 25
Copper, uncr'bled, heavy	11 50	11 50
Copper wire, uncrc'bled.	11 00	11 50
No. 1 machine compos'n	10 50	10 75
No. 1 comps'n turnings..	9 00	9 00
No. 1 wrought iron	9 00	8 00
Heavy melting steel	7 00	8 50
No. 1 machinery cast iron	13 00	12 00
New brass clippings	8 50	8 75
No. 1 brass turnings	7 25	7 50
Heavy lead	3 75	4 00
Tea lead	3 00	3 00
Scrap zinc	3 00	3 50

WROUGHT IRON PIPE.

The following are Toronto jobbers' discounts on pipe in effect from April 21, 1913:

	Buttweld		Lapweld	
Standard	Black	Gal.	Black	Gal.
¼, ⅜ in.	64	49	....	....
½ in.	69	58	....	....
¾ to 2 in.	73½	63½	....	....
2 in.	....	....	69½	59½
2½ to 4 in.	73	63	72	62
4½ to 6 in.	....	....	73	63
7, 8, 10 in.	....	....	67½	56½
X Strong P. E.				
¼, ⅜ in	56½	46½	....	....
½ in.	64	54	....	....
¾ to 1½ in.	68	58	....	....
2 to 3 in.	69	59	....	....
2½ to 4 in.	....	....	66	56
4½ to 6 in.	....	....	68	59
7 to 8 in.	....	....	59	48
XX Strong P. E.				
½ to 2 in.	43	33	....	....
2½ to 4 in.	....	....	43	33

PRICES OF WROUGHT IRON PIPE.

Standard. Nom. Diam.	Price. per ft.	Extra Strong, Sizes Ins.	Price per ft.	D. Ex. Strong, Size Ins.	Price per ft.
⅛in	$ .05½	⅛in	$ .12	½	$. 32
¼in	.06	¼in	.07½	¾	.35
⅜in	.06	⅜in	.07½	1	.37
½in	.08½	½in	.11	1¼	.52½
¾in	.11½	¾in	.15	1½	.65
1 in	.17½	1 in	.22	2	.91
1¼in	.23½	1½in	.30	2½	1.37
1½in	.27½	1½in	.36½	3	1.86
2 in	.37	2 in	.50½	3½	2.30
2½in	.58½	2½in	.77	4	2.76
3 in	.76½	3 in	1.03	4½	3.26
3½in	.92	3½in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4½in	1.27	4½in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.86	...	.....
7 in	2.38	7 in	3.81	...	.....
8 in	2.50	8 in	4.34	...	.....
8 in	2.88	9 in	4.90	...	.....
9 in	3.45	10 in	5.48	...	.....
10 in	3.20	....	....	...	.....
10 in	3.50	....	.....	.....	.....
10 in	4.12	....	....	...	.....

METALS.

	Mont'l.	Tor'to.
Lake copper, carload	$16 00	$16 25
Electrolytic copper	15 25	15 75
Casting copper	15 10	15 60
Spelter	5 25	5 25
Tin	39 00	40 00
Lead	5 15	5 25
Antimony	8 50	8 50
Aluminum	21 00	21 00

SHEETS.

	Mont'l.	Tor'to.
Sheets, black, No. 28	$2.75	$2.70
Canada plates, ordinary, 52 sheets	2.75	2.75
Canada plates, all bright	4.00	4.15
Apollo brand, 10¾ oz. (American)	4.30	4.20
Queen's Head, 28 B.W.G.	4.40	4.40
Fleur-de-Lis, 28 B.W.G.	4.20	4.25
Gorbal's Best, No. 28	4.40	4.40
Viking metal, No. 28	4.40	4.40

MISCELLANEOUS.

	Cents
Putty, 100 lb. drums	$2.60
Red dry lead, 5 cwt. casks, per cwt.	6.00
Glue, French medal, per lb.	0.10
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.26
Benzine, per gal.	23½
Pure turpentine	0.60
Linseed oil, raw	0.60
Linseed oil, boiled	0.63
Plaster of Paris, per bbl.	2.10
Plumbers' Oakum, per 100 lbs.	3.25
Pure Manila rope	0.17

COKE AND COAL.

Solvay Foundry Coke	$5.95
Connellsville Foundry Coke	5.20
Yough, Steam Lump Coal	3.88
Penn. Steam Lump Coal	3.68
Best Slack	3.05

All net ton f.o.b. Toronto.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents.

Montreal, December 22, 1913.—While the close of the year finds the machinery and metal-working trades undeniably quiet, a growing feeling of confidence is showing itself, and it seems to be generally believed that the pendulum has about reached the end of its swing and that better times are soon due. One reassuring sign that money is becoming easier is to be found in the fact that from all over the Dominion reports state that collections are considerably better than they were a month ago, this being particularly true of the West—as was only to be expected. It is also an exceedingly encouraging sign that industrial statements issued lately by such firms as the Dominion Bridge Company and the Canadian Car & Foundry Company show earnings well above the average. The local machinery brokers have also had a good year, all reporting a considerably increased turnover as compared with 1912; and this in spite of the dullness of the past two or three months.

Manufacturers, and merchants generally, experienced a great sense of relief on December 18 when the Canadian Pacific and Grand Trunk Railways officially announced that they would continue the present cartage arrangements until further notice, in view of the urgent demands of the merchants throughout the country and their voluntary offer to pay the cost of the service.

Under the present arrangement the railway companies have contracts with the cartage companies, and levy a flat rate for the whole city on the merchants receiving the freight; and it has long been contended that the rate is too low. The railway companies have not yet indicated what the new arrangeemnt will be, whether a higher flat rate will be levied, or whether a zone system will be introduced; but the point of greatest interest to the shippers is that the railways will deal direct with the carters, thus saving shippers and consignees the necessity of making their own cartage arrangements.

This solution of the difficulty was quite unexpected; as up to the day previous to its publication, the railways had protested that nothing would induce them to continue the present scheme after January 1, 1914.

Pig Iron, Etc.

There is very little business doing in pig iron and many foundries are closing down over the holiday season. Copper and spelter are also very quiet. In sympathy with the London market, tin fell heavily during the week and is now being quoted locally at 39 cents, which is the lowest figure since 1911.

Toronto, Ont., Dec. 23, 1913. — The most important feature of the iron and steel market this week was the drop in price of wrought iron pipe. This reduction is noticeable most in small sizes of buttweld pipe and will be appreciated most by plumbers and steamfitters who have already made big contracts based on the old wrought iron prices. The drop applies to all makes of wrought pipe, and is a result of American competition. The change went into effect December 15.

The contract for the city intake pipe has been awarded to the Thor Iron Works, Bathurst St. This was awarded by the general contractors, Roger Miller & Sons, and consists in making the pipe, preparing the bed, and putting the pipe in place from the pure reservoir on Toronto Island to the south tunnel shaft. The pipe will be made according to the city's specifications. It will be 3,600 ft. long, and 84 inches diameter. Carnegie steel will be used, supplied through Drummond, McCall & Co. This job will keep the Thor Iron Works busy for the winter.

C.P.R. Contracts.

The Canadian Pacific Railway has ordered 100,000 tons of rails from the Algoma Steel Corporation and 25,000 tons from the Dominion Steel Corporation.

The Steel Co. of Canada held its second annual convention of sales managers and travelers in Montreal last week, winding up with a dinner at the Montreal Club, at which the toasts were The King, The General Manager, Our Works, and Our Representatives. Several important speeches were made, dealing with the work and policies of the company. Among those present from Ontario, were: Messrs. Robert Hobson, F. H. Whitton, Corbett Whitten, R. G. Wells, Geo. A. Simpson, Geo. Spence, C. E. Harrison, W. D. Muir, J. B. Detwiler, F. B. Cowan, T. Moore, W. A. Rowland, J. H. Webber, T. F. Hodgson, W. F. Hodgson, Geo. Miller, C. G. Knott, J. Orr Callaghan, J. Morrow, J. B. H. Richaby, L. T. Walls, H. G. Rogers and G. D. Hatfield.

All manufacturers outside of structural steel, are specifying more freely against contracts. Practically all manufacturers, particularly implement men, feel that prices of steel are as low as they will go, and are getting ready to talk business.

Most steel concerns are taking stock, or are preparing for it.

Machine Tools.

The Canadian Fairbanks-Morse Co., Ltd., are closing a nice year. They are in the middle of an inventory, and from present appearances, all records of the Toronto house have been beaten. The fiscal year ends with the close of December.

In the machine tool world, every broker is straining to secure a portion of the Michigan Central Railway's order for tools for their new St. Thomas shops, which are practically completed.

The Ford Motor Co., Walkerville, were ordering tools last week, consisting of presses, grinders, centering machines and threading machines, for their motor department. The Kelsey Wheel Co., Walkerville, are buying small machine tools, but the bulk of their equipment was secured in Detroit. Their order for electric motors went to the Canadian General Electric Co.

The Hill Leonard Construction Co., contractors for one section of the new Welland Canal have bought machine tools, locomotives, steam shovels, dredges, etc., from the A. R. Williams Co. this week. The City of Toronto, through Commissioner Harris, is buying machine

tools. The Galt Knife Co., have bought machine tools consisting of grinders, drop hammers, milling machines, lathes, shaper, etc., from the A. R. Williams Co. Their equipment would cost about $5,000.

Machine tool makers are taking advantage of the slack season to improve their machines. Several new types should be put on the market shortly.

Metals.

In Toronto there has been little change in the metal market. One large dealer, after reporting absolute stagnation, remarked that with the pasing of 1913, he trusted good luck would return. 1913 certainly has been a poor year in the metal business.

St. John, N.B., Dec. 20, 1913.—The closing year in St. John, Halifax, Moncton, Amherst, New Glasgow, and other centres throughout the Maritime Provinces sees manufacturers' and industrial interests well satisfied with what 1913 has held for them. It has been a poorer year generally in many respects throughout Canada, but the East has seemingly not felt the direct influence of the depressed conditions so much as has been the case elsewhere, because talking to any head of an industrial concern, one will be told that his business was particularly encouraging this year. That such is the case reflects considerably upon the prosperity of the East, and has caused keen satisfaction throughout the maritime business world.

New industries have come to almost every town and city; old ones have been enlarged. All are recording now the close of a successful year and entering upon 1914 with renewed vigor and hopes that when it has rolled by they will be even better satisfied than now. It is true that in some spheres of industrial life, notably the lumber industry, trade has been below the average, but this condition is not general, and is not so much the effect of business in the eastern parts of Canada as in the outside world, the British and American markets.

Supplementary letters patent have been issued, increasing the capital stock of the T. S. Simms Co., Ltd., from $199,000 to $298,000. Business with this industrial house since they started in their handsome new factory at Fairville this year has been most encouraging. They are possessed of the most up-to-date brush manufacturing house in Canada, and their stock has found its way as far west as British Columbia, and as far south as the West Indies. Their former factory in St. John, has been taken over by the Corona Mfg. Co. confectionery manufacturers, who are associated to a certain extent with the firm of Ganong Bros., manufacturers of St. Stephen, N.B. The Corona Mfg. Co. are now operating the plant.

Plans have been filed for the I.C.R. spur line from the main line to Courtenay Bay, St. John, and several properties will have to be taken over by the Government before the line can be constructed, but arrangements to this end are about complete. The cost of acquiring will be in the vicinity of $200,000.

There is a possibility of another industry being established in St. John early in the new year. Charles L. Sanford, of the Sanford Barrel and Keg. Mfg. Co. was in the city from Upper Canada this week looking over a possible site. He said it was the intention of his concern to establish a factory with a capacity of 5,000 barrels a day in the Maritime Provinces, and St. John was regarded as a favorite site. The Company plans on having a chain of factories through Canada. They manufacture barrels on a new principle, using wide pieces of wood with the ends slit so as to form the curve of the barrel. Machinery will be installed in the projected plant for the making of egg and berry boxes, crates, etc.

The St. John Street Railway Co. has decided to extend its lines as far as Crouchville, and the continuation of the rails will commence at once. The extension is to be completed to Crouchville by August 1, 1914.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Engineering

Sarnia, Ont.—The Sarnia Bridge Co., Ltd., has increased its capital from $50,000 to $200,000.

Hamilton, Ont.—Rae Brothers, Hamilton, have started the manufacture of a full line of chucks.

Cobourg, Ont.—A new washing machine factory has been started here by Welsh, Roberts, Bishop & Co.

Gananoque, Ont.—The St. Lawrence Steel and Wire Co. have erected a large addition to their factory for storing raw materials.

Fort William, Ont.—The National Tube Co. have finished their plant, and will employ 100 men in the manufacture of small pipe.

Sarnia, Ont. — Brick masons have started work on the Perfection Stove Company plant. The steel framework is all finished.

Mappin & Webb, the noted Sheffield cutlery firm, who have established a house in Montreal, will spend £150,000 on further development.

Kingsville, Ont.—The R. F. Green Co., Ltd., will build a stove foundry here on a site given by the town, and will borrow $6,000. Voting on by-law, January 6.

Grimsby, Ont.—The Canada Specialty Co., who have converted the rink on Victoria Avenue into a factory, are purchasing machinery, and will begin operations shortly.

Waterloo, Ont.—Bechtels, Limited, manufacturers of clay working machinery, have been offered a big loan if they will move their plant to Mount Forest, Ont.

St. Catharines, Ont.—The Russell-Jennings Mfg. Co., who will erect a plant here next year for the manufacture of augers, anger bits, etc. They have their parent plant at Chester, Conn.

Seek Motor Trade.—In view of the fact that Great Britain supplies only 3½ per cent. of the motor vehicle trade with Canada, British makers are considering a scheme for small groups to amalgamate and float a subsidiary Canadian Company, with a Dominion charter.

Fort William, Ont.—An automobile factory is among the probable new industries for Fort William next year. The man behind it has $100,000 capital, and asks the city for a site.

Fort Francis, Ont.—The Canadian Northern Railway intend making several improvements at this point by building a car repair and machine shops, also increasing the capacity of the present round house to three times its size.

Berlin, Ont.—The Canadian Buffalo Forge Co., Ltd., advise that they will not be ready to purchase machine tools for their new plant at Berlin for a month or six weeks. Allan G. McAvity, managing director, Montreal.

London, Ont.—The Ideal Electric Mfg. Co., manufacturers of electric irons and electrical goods, are moving to Wallaceburg to amalgamate with the Wallaceburg Brass Mfg. Co. An addition to the latter's plant will be erected.

Fort William, Ont.—The new plant of the Steel Co. of Canada will not be ready for operation until the spring. It will have a capacity of 150 tons of finished wire per day, with provision for further extensions. The machinery has not yet been purchased.

Walkerton, Ont.—The Walkerton General Casting Foundry, owned and built by Isadore A. Ellinghausen, commenced operations on December 13. The work is mainly jobbing. The plant is driven by electric power. Besides the regular foundry equipment, it contains several machine tools.

Hamilton, Ont.—D. V. Byrnes, president and manager of the Ontario Pipe Line Co., who has just returned from Chicago, whither he went in connection with the financing of the United Gas and Fuel Co., announces that the $1,000,000 bond issue had been disposed of. The company will erect a large by-product coke plant.

Rock & Power Machinery, Ltd., who recently opened up in the Royal Bank Building, Toronto, are carrying the following agencies:—Kennedy Crushing plants, mining and milling plants, cement plants; McKierman-Terry rock drills, hammer drills, pile hammers and compressors; Erie engines and boilers; Exeter Machinery Co., locomotive cranes, contractors' hoists, coal handling and piling machinery; F. J. A. B. drill steel, James ore concentrator tables, power plants, (hydro-electric, steam and air), water power plants and supplies, Ottumwa hoists.

Sault Ste. Marie, Ont.—F. H. Clergue announces that all money has been secured, and everything is ready to commence operations on the new dry dock here. The contract for constructing the plant has been let to the British Construction Co. of London, England. Work will commence in the spring and $250,000 be spent next year and $2,000,000 in two years.

Kingston, Ont.—The Canadian Locomotive Co. has received orders for ten more locomotives, which, with the extension of the Government contract which was placed less than a month ago, will keep the works busy until May at least. A. W. Wheatly, general manager of the company, announced this week that orders had been received for the following:—One saddle-tank locomotive for the British Columbia Equipment Co., Vancouver; two saddle-tank locomotives for the Confederation Construction Co., Welland Canal; one saddle-tank locomotive for the Union Carbide Co. of Canada, Welland; six Moguls for J. D. McArthur, Hudson Bay Construction Co.

(Continued from page 702.)

will also be made here for the draughting department.

The foundry at the plant on Victoria Avenue has been converted into an extension to the machine shop, and the pattern storage into a warehouse for new machinery. The former has been equipped with new machine tools, including a Cleveland automatic lathe, a boring mill, made by Butler, Halifax, England; key slotters, and other tools necessary to cope with an increased production of the heavier lines of shears and presses. They are now turning out 10-foot presses, weighing 30,000 lbs.

The officers of the Brown, Boggs Co. are: J. M. Brown, president; T. A. Brown, vice-president and superintendent, and W. E. Blandford, secretary-treasurer. Resident agents are employed in Montreal, Toronto, Winnipeg and Vancouver, and stocks are carried at Toronto, Montreal, London, Winnipeg, Calgary and Vancouver.