REMARKS

ON THE

MINING REGION OF LAKE SUPERIOR;

ADDRESSED TO THE

COMMITTEE OF THE HONORABLE THE EXECUTIVE COUNCIL,

AND

REPORT

ON

MINING LOCATIONS

CLAIMED ON THE CANADIAN SHORES OF THE LAKE,

ADDRESSED TO THE

COMMISSIONER OF CROWN LANDS,

BY

W. E. LOGAN,

PROVINCIAL GEOLOGIST.

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If I have gathered aright the questions put to me by the Committee of the Honorable the Executive Council, respecting the mineral region of Lake Superior, I understand the Government to be desirous of having the expression of an opinion as to the data upon which it would be judicious to proceed, in ascertaining the value of the mineral district in question; and the principles which should be taken into consideration, in dividing it into lots for the purpose of mining locations.

To the possible existence of a mining region of some value on the north shore of Lake Superior, allusion was made in the Report I had the honor to submit to the Government, of the progress made in the Geological Survey of the Province in 1843; and, in assuming its probable importance, I do not feel myself so much influenced by the reports that have been so diligently spread since the commencement of the present mining excitement in the United States, as by the unprejudiced account regarding the mineral riches of the southern shore, furnished to the Legislature of Michigan, by the late Mr. Douglas Houghton in 1841, in his report on the geological structure of the Upper Peninsula of the State.

The geology of Michigan occupied the attention of Mr. Houghton for eighteen years, during the last eight of which he was officially employed by his Government in investigating its mineral resources; and it was in the prosecution of his duties, as state geologist, that he lost his life at the end of last season. His character stands high among those who have paid attention to the same branch of science; and his reports are noted for great caution and moderation in the statement of his opinions. It is understood that he had visited the British shores of Lake Superior, and considered their mineral character much the same as that of his own side of the water, though, I believe, he has made no published statement to such an effect.

What the extent of the mining region may be on the British

side of the Lake, and how far, and in what direction it may penetrate into the interior, can be ascertained only by patient and laborious exploration; and it is impossible to say, without some description of reconnaisance, in the first instance, what length of time may be required to complete an investigation of it; but this will, of course, much depend on the degree of minuteness to which its supposed value may render it expedient to carry the examination.

The uncertainties of mining are so great, that, even after a careful investigation, it is often times very difficult to estimate with precision, the value of a mineral district. Any opinion in regard to it must of course be founded on the quantity of productive mineral, the cost of mining and bringing it to the surface, and of dressing or shaping it for transport to a market, as compared with the price to be obtained for it after its arrival there. No very great difficulty would perhaps be encountered in any case in ascertaining all the elements of the calculation, with the exception of the first, that is, the quantity. This difficulty would exist in some cases. With regard to such minerals as are deposited by nature with regularity, the quantity could be ascertained with facility. In the instance of coal, for example, which is always deposited in extensive sheets of pretty uniform thickness, the rule is, that about 1000 tons could be obtained from every one foot thick of every superficial acre of a bed. But it is not so in respect to mineral veins, the most common form in which metallic ores occur.

Mineral veins, as distinguished from mineral deposits, in general occupy what are supposed to be cracks in the rocks of a country; and these cracks are considered to be the result of subterraneous upheaving forces, which have broken the continuity of the rock. The crack is usually accompanied by a slip, or dislocation of a greater or less amount, by which parts in the plane of the crack, that do not fit, are brought opposite to one another, giving space for the subsequent secretion of the mineral. It is evident that a fissure of this description, in which salient parts on opposite sides would touch, and reentering parts would recede from one another, would produce a very irregular mould, and the mineral vein just fitting it, would have a quantity that no *a priori* reasoning could determine with precision.

Mineral veins may be divided into two kinds, distinguished by the supposed mode in which the crack may have been filled up. The mineral matter may have been injected from beneath, into the mould, in a condition fluid from heat; in which case, it would be a dyke, and the quality would have a considerable amount of uniformity: or it may have been secreted by means of deposit from infiltrated fluids holding the mineral substance in solution; or through the influence of electro-magnetism, carrying it from the interior of the rock of the country, or wheresoever it may be within the influence of the magnetic current, to the receptacle of the vein; or by a combination of both these causes. In this case, the endless modification of the acting forces, may have produced an almost endless variation in the arrangement of the mineral substances, in regard both to their quality and distribution; and the irregularities thus occasioned, would greatly enhance the difficulty of estimating the quantity of the productive part of a mineral vein. These theories are mentioned, not so much for the purpose of asserting their truth, as for that of alluding to the generalization of the facts which have led to their adoption.

Metalliferous veins, or metalliferous *lodes*, as they are termed by miners, are of the complicated description last mentioned. They are sometimes perpendicular, but usually at a high angle of inclination to the horizon; and in general they are partly filled up with metallic, and partly with earthy minerals, the proportions these bear to one another being very various in different cases, and often very different in separate parts of the same lode; and it often happens that in some parts of the lode there will be a very great deficiency in the productive material, giving intervals of what is termed *dead ground.*

In a great mineral district, such as the Counties of Cornwall and Devon, in England, where 30,000 of the inhabitants are engaged in working upwards of 160 mines, and the value of the metals annually raised exceeds £1,500,000—more than half the value of all the metallic products of Great Britain and Ireland, with the exception of iron, which amounted to £8,000,000 according to Sir Hy. T. De la Beche's Report, in 1838, and probably, now surpasses it—there is a vast amount of floating knowledge in regard to almost all the mineral veins, even to

their inmost parts; and so many analogies for the solution of neighbouring cases are established, by facts ascertained in such an extensive range of excavations, which, in some single large mines, taking adit-levels, horizontal galleries, and vertical shafts, equal upwards of sixty miles, that a fair guess can often be made of the productive contents of a vein, from careful surface inspection. Yet, even in Cornwall, the hopes of the miner are very frequently disappointed; and adventurers in a new mine are seldom very sure of their operations, until a trial level has been driven longitudinally in the lode, and more than one shaft sunk vertically, to ascertain facts upon which to found a calculation of what the produce of the whole mine might be.

In Cornwall, however, the productiveness has been so far ascertained, that an average rate of *lordship*, or rent, to be paid the owner of the mineral ground, is pretty well established. For copper and tin ground, the lord's dues vary from four to six per cent. of the gross produce of the mine; if the mineral ground be equally good, deep mines would pay less than shallow ones. It is generally understood that the charge does not commence until the mine has begun to pay cost; for it is greatly to the interest of the landlord to facilitate as much as possible the opening of the lodes, and thus ascertain their true character, which, if it be a favorable one, may establish a revenue for him for a great period of time.

The aggregate value of the ore, raised in the Consolidated Mines in Gwennep, in Cornwall, for 13 years, from 1823 to 1835, was	£1411270
The lord's dues, in that time, amounted to	58797
Being rather over four per cent. of the gross produce.	
The value of the ore in these mines, in the year 1836, was	145717
The lord's dues were	6071
Leaving a nett value of the ore of	139646
The total amount of expenses was	102007
Leaving a profit of	£37639

So that while the lord's dues were over four per cent. of the gross produce, they amounted to nearly one-sixth of the profits.

In the United Mines, which adjoin the Consolidated Mines, and are under the same management, the value of the ore raised, in 1836, was	£26379
The lord's dues amounted to	1099
Leaving a nett value of the ore of	£25280
The total amount of expenses was	35960
Leaving a loss of	£10680

The extent of the Consolidated and United Mines is nearly two miles long: their greatest depth is 1,800 feet.

In the Fowey Consols Mine, the quantity of ore raised, in 1837, was 15,710 tons of 21 cwt.; which produced a sum, including carriage money, (the ore having been probably transported to a port before being sold,) of	£89083
The lord's dues amounted to	4886
Leaving a nett value of the ore of	£84197
The total amount of expenses was	68376
Leaving a profit of	£15821

The lord's dues in this case amount to about five and a half per cent. on the sale value of the ore; but as this value was enhanced by their carriage, the true lordship value of them must be something less than the sum stated; and the lord's dues would, on this reduced sum, show a larger per centage, probably upwards of six per cent., while they amount to between one-third and one-fourth of the profits.

The extent of this mine is two miles in length, the greatest depth is upwards of 1100 feet.

Fowey Consols, including Lanescot Mine, which had merged into it, had divided among the Shareholders, at the time of Sir H. T. De la Beche's Report in 1838, a total profit of nearly £133,000, after paying all the original outlay for bringing the mine into a productive condition, as well as all the machinery and materials still on the mines, the value of which, with the balance in hand, was about £50,000.

Though the Consolidated Mines and the Fowey Consols are given by Sir H. T. De la Beche as perhaps the largest mines in Cornwall, in 1838, the former employing 2,387 persons, and the latter 1,706 persons, he does not mention them as the most profitable. Tresavean Mine is stated to be the most valuable, its average profits for five or six years, to 1838, having been between £40,000 aud £50,000 per annum.

The following list, however, of the copper ores sold to the British smelters, in the year ending 30th June, 1838, at public ticketing, as it is termed, (which is a species of auction, where each bidder, being a smelter, makes a written offer for each parcel as it is put up,—all making them simultaneously, and none knowing what the bid of his neigbour is—and the highest tender gets the parcel,) will show, by the small quantity produced from many of the mines, that a great number of them must be concerns of little or no profit.

The total quantity of copper ore in tons of 21 cwt. was 145,688 tons.

The average produce of the whole was $7\frac{7}{8}$ per cent.

The total quantity of fine copper in tons of 20 cwt. was 11,529 tons.

The average price of the ore per ton of 21 cwt. was £5 17s. 6d.

The total value of the ore was £857,779.

The number of mines which produced it was 76.

The value, as distributed among these seventy-six mines was as follows:—

							£	s.	d.
1	Mine gave over	£100,000,	and above	19,459	Tons....		126211	12	0
1	do	do	80,000,	do	15,254	do	85434	19	0
1	do	do	70,000,	do	12,303	do	76272	9	0
2	do	do	40,000 each,	do	15,052	do	81548	11	0
1	do	do	30,000,	do	2,910	do	37070	1	0
5	do	do	20,000 each,	do	21,770	do	121588	18	0
11	do	do	10,000 do	do	27,482	do	158872	11	0
14	do	do	5,000 do	do	18,021	do	101297	17	0
2	do	do	4,000 do	do	1,291	do	9447	17	0
7	do	do	3,000 do	do	5,136	do . ..	24982	7	0
6	do	do	2,000 do	do	2,778	do	14714	9	0
6	do	do	1,000 do	do	1,838	do	9227	16	0
11	do	do	500 do	do	1,832	do	8452	16	0
3	do	do	400 do	do	872	do	1293	8	0
2	do	do	300 do	do	76	do	708	17	0
1	do	do	200	do	86	do	270	12	0
2	do	do	100 each,	do	28	do	383	15	0
76					145,688	do	£857778	15	0

About fourteen of the above seventy-six mines yield tin as well as copper, which is not taken into account in the list, and would serve to improve the aspect of so many of them; but they are chiefly those which produce a considerable quantity of copper. The value of the total quantity of tin raised in 1837, from seventy-two mines, including the above fourteen, which might yield about £25,000 of the amount, was £363,322.

The minerals bearing economic value which occur on the shores of Lake Superior, are the ores of copper, and though Mr. Houghton mentions that these are occasionally associated with the ores of zinc, lead, iron, manganese and silver, the copper ores appear to be those which, in his opinion, render the region worthy of mining attention. The chief difficulty, therefore, in obtaining the elements of a calculation by which to arrive at the value of the Canadian part of the region, will be to determine the quantity of these copper ores: and the only data on which an estimate of this can be founded, are the number of veins holding the ores, the extent to which they run, and the quantity of ore in each.

It will not be until the shores of Lake Superior have been operated on as a mining district for a considerable number of years, that anything like an accurate knowledge of these facts can be obtained: but, by a careful surface examination, a rude imperfect guess may be made at the productiveness of parts. The examination would necessarily be such as a miner would institute in searching for copper veins, with an intention of working them. The veins must first be discovered, then followed to ascertain their direction and extent, and a calculation be made of the approximate quantity contained in them, by taking what is seen on the surface in as many parts in the run of each vein as possible, as an index of its interior quality both horizontally and vertically.

But, as no surface examination can equal trial levels and shafts in the veins, it would be to the interest of the Government, as landlords and owners of the lodes, to encourage, to a limited extent, the working of some of them, by such companies of respectable persons as might be found willing to risk their capital in mining adventures; especial care being taken,

in granting mining locations, to secure a *bonâ fide* intention of working the minerals, and to avoid the encouragement of mere stock-jobbing speculation. One judicious means to this end, it appears to me, would be, that the mining locations should not exceed in magnitude the strength of the working capital of the adventurers. It would no doubt be judicious that the first adventurers should obtain their locations on the most liberal terms; but, in my humble opinion, it would not be impolitic that there should be some stipulation on the part of the Government that a certain number of miners should be employed on each location. To drive one level with full vigour would require six miners, who, working two at a time in *stems*, or periods of eight hours, would occupy the day.

The mineral character of both shores of the Lake being much the same, the mining operations now in progress, on the American side, at Keweenaw Point, will be of essential service in elucidating what may be expected on the Canadian; and the knowledge to be gained by these experiments, a vast number of which cannot fail to prove unsuccessful, may be made the means of diminishing useless expenditure of capital in proving the Provincial ground, and render it the less necessary to extend the scale of present Provincial adventures.

In some of the American accounts which have appeared before the public, it is represented that between 300 and 400 tracts have been located on the south shore, but a small number of which have been thoroughly examined; and the names of twenty-four companies are given as being at work, and employing about 500 resident miners.

In the American system, connected with the disposal of public lands, after they have been sold by the General Government at an upset price, for the general benefit, they become subject to the laws of the particular state within the territory of which they lie; but the General Government claim also the right to lease public mineral lands for the public benefit; in which case, if I am rightly informed, though the protection of the laws of the particular state in which they lie, is extended to those who occupy them, it is doubtful whether the lands can be taxed for their share of state expenses.

The mining locations in the Northern Peninsula of Michigan, which have been granted on leases of this description, have been given for three years, at a lordship of six per cent., as I am informed, on the value of the ores smelted, which no doubt was intended to be equivalent to six per cent., either of the gross produce of the mine, after the ores should have been reduced to a shape fit for market; or, what would be a heavier charge, of the pure metal after it had been extracted from the ores. In the first instance, the size of the locations, without due consideration, was made nine square miles; but the applications for them became so numerous, that it was subsequently considered judicious to limit them to one square mile. The first step in obtaining the lease of a location, seems to have been to procure a license or permit, to explore; which remained in force for one year, at the end of which the applicant made his election of an unappropriated lot, which was given on the usual terms. No licenses of exploration have, I understand, been granted since May, 1845, so that all the leases will have expired a little over three years from this time.

The leasing system does not appear to work harmoniously between the General Government and the particular State; and an expectation seems to be entertained, that the locations will, at the termination of the present leases, be sold at the ordinary price of public lands, when, no doubt, the present occupants on leases will, as is but just, have the right of preemption. No revenue, as I am informed, has been collected from these leases, there having been no establishments erected for smelting the ores; but several officers have been appointed, and domiciled in the vicinity of the mines to receive the Government dues; whose only acts have been to sign permits for the removal of the ores to Boston and other distant places. On the expiration of the leases, it seems probable the only operation that will have resulted from them will be, that they will have afforded the adventurers three years to prove their mines. Those who have made fortunate selections will become the purchasers of their locations, and those who find they have drawn blanks in the lottery, will abandon them, sacrificing the expenses of their experiment.

If a system of leases should be adopted by the Provincial Government, the term granted should, in my opinion, be a long one. I should not feel disposed to place confidence in the *bonâ fide* mining intention of any company of adventurers who would take a short one. A mine, unless it be an exception to a general rule, can scarcely be properly worked without considerable outlay to put it into a productive condition, particularly in a new locality, at a distance from a well settled country, and from a market with which to establish a traffic; and it is but reasonable that the adventurers should have ample time to receive it back, with a large profit to reward their enterprise.

The Cornish leases, I believe, are usually granted for a term of twenty-one years, with perpetual right of renewal. The lordship, as already mentioned, is from four to six per cent. of the gross produce of the ores sold; and there is always some stipulation in the lease, that a certain amount of work shall be done, by the employment of a certain number of miners, or the operation of one or more steam-engines, according to the extent of the *sett*, or mining ground leased. The extents of the setts are as various as the number of mines; a square mile would be considered a large one. Dolcoath sett, as gathered from a surface plan given in Sir H. T. De la Beche's Report, is about 1200 yards in the run of the lodes, by about 800 yards across them; this Mine is about 200 fathoms deep; in 1815, it produced copper ores to the value of £66,839; in the list of copper ores sold in the year ending 30th June, 1838, given above, the value of its ores is put down at £13,787. Fowey Consols sett, as already mentioned, is stated by Sir H. T. De la Beche, to be nearly two miles on the run of the lodes, which are numerous, and, as gathered from his plan of the mine, about 500 yards across them; the depth of the mine, as mentioned before, is about 190 fathoms. The value of the ores raised from it in 1837, was £89,083; the value of its ores in the list of ticketing sales for the year ending 30th June, 1838, is put down at £85,434; it then employed upwards of 1700 persons. The Consolidated Mines, which are probably the largest in Cornwall, as already stated, have a length of nearly two miles; I am not aware of the breadth of the sett, but I am

persuaded it is over stated at half a mile; a much less space would probably include all the parallel lodes. The greatest depth is 300 fathoms; and it is stated by Sir H. T. De la Beche, that during twenty years, to 1838, underground operations in sinking and driving, mostly in solid rock, for the sole purpose of discovery, had been executed in the mine, to the extent of about 55,000 fathoms, or about sixty three miles, at an expense which cannot have fallen short of £300,000.

Should the Government, for the purpose of proving a portion of the lodes, pursue the plan of granting a limited number of mining locations, in free and common soccage, at a fixed price, with the hope that the private interests of parties will induce them to work the mines, it is quite impossible to form any opinion of a fair value. A very low price might be too much, and a very high one too little; but it would only be in some extraordinary case that any prudent miner would, in my opinion, be justified in paying a high cash value for a distant unimproved mine. In such sales of locations, it must be recollected that all control over the working and proving of the mines would be relinquished by the Government; and the private interests of parties might, in some cases, carry them no farther than the establishment of a company for the purpose of a traffic in shares; while in others, persons of a less sanguine temperament than their neighbours, might patiently wait to observe the success or failure of the more adventurous.

In some of the documents that are placed in my hands by the Committee of the Council, I observe that some of the applications for mining locations, from single parties, look to an extent of mineral tract that (in one case) would not fall greatly below about one-third of all the good mineral ground of Cornwall and Devon, which, as far as I can make it out from the six districts into which Sir H. T. De La Beche divides it, after tracing them on the Index to the Ordnance Geological Maps of those counties, (which Index, accompanying his Report, is, however, on a very small scale,) comprises an area of about 700 square miles. Such an unbounded claim, it appears to me, can only arise from an imperfect exploration. The party perhaps have not exactly fixed, to their own satisfaction, the precise spot they would choose for their mining operations; and a hasty applica-

tion for a large tract, or several large tracts, which contain indications of mineral lodes, is preferred, in order to secure surface enough, from which to select a good locality without interference, at a more leisure moment. It is scarcely necessary to state, that it appears quite beyond the bounds of probability such an enormous district can be worked to the public advantage, by any one party; and the acquirement of it would therefore assume much the character of a monoply.

On the American side of the Lake, I understand much confusion has arisen, much inconvenience been experienced, and many disputes occasioned, from the circumstance of locations having been assumed, previously to a linear survey for the determination of boundaries. It appears to me that it would be for the public advantage, on the Canadian side, if some plan of systematic division into lots, for mining locations, were carried into operation, before many of them were granted. The duty of running the lines would come within the department of a sworn provincial surveyor; but the proper direction to be given them, and the most advantageous form of the lots, may be connected with considerations of a geological character.

Cracks, or dislocations, which have become the seats of mineral veins, appear, in general, to run in one or other of two directions; one is parallel to the general range of the rock masses, and the other transverse to it. In Cornwall, the metalliferous veins appear to be in the range of the rock, the general direction varying from twenty degrees North to twenty degrees South of East and West. On Lake Superior, they appear to run transverse to the range of the rock masses, approaching N. 15 W. to N. 25 W. This, however, must not be taken for granted. On referring to Captain Bayfield's Map of the Lake, it will be observed, that the Northern Shore all the way from its upper extremity to Fluor Island, Isle Royal, and Keweenaw Point on the South side, have a rude parallelism to one another. This geographical feature, it is probable, will be found to result from the range of the rock masses; and it appears to me not unlikely that the metallic veins will present a general bearing at right angles to it.

The proper direction of the side lines of the mining locations would be parallel to the average course of the veins.

There is little doubt it would be the direction most agreeable to the mining adventurers; for if the superficial area be a fixed quantity, it would be much to their advantage that the form of it should have a greater measure on the run of the veins than across them. The average general bearing of the veins can only be determined by observation; and it will not be the inspection of one, two, three, or a dozen of them that will suffice to establish it. It will require a very extended examination of a vast collection of them, and that for some distance on their course to attain any thing like precision; and it therefore would be many months after an examination was commenced, before the proper direction of the side lines could be decided on. The parallelism of the mineral veins, however, will not be found so precise, that any direction fixed upon will do for every case; whatever direction is adopted, it will interfere with the veins in some instances. The task will be to choose such a bearing that the interferences will be as unfrequent as possible. In such an extended length as Lake Superior presents, the range of the rock masses may gradually change its course; the course of the mineral veins would probably change with it; and it may therefore become expedient to adopt directions for the side lines, differing in a moderate degree in districts widely separated from one another.

The direction of the lines determined, it would come within the province of an experienced provincial land-surveyor to point out the most convenient and economical mode of effecting the divisions. It appears to me much more easy to find objections to any mode I have heard proposed, than to suggest a satisfactory one. Any attempt to refer the divisions to latitudes and longitudes, could not fail to be unsuccessful; it would be attended with perpetual disputes and litigation; for it seldom happens that any two observers will make the latitude and longitude of a place exactly the same, nor will any one observer bring out the same result at different times of trial. Marked points along the coast might be arbitrarily assumed, from which to start the divisional lines; but with such a broken front as the coast of Lake Superior presents, the points could not be so chosen as to preserve any approach to

uniformity in size or shape in the lots; and without constructing a map of the coast, it would be impossible to calculate approximately even, the breadth or area of any of them. If lines were laid down on a map already constructed, with a view to identify the position of their termination on the coast, the difficulty would be even greater; it would be less tedious to map the coast, than to search out the points. Possibly, the best plan would be to run a general line through the woods, at a certain average distance from the Lake, in the direction transverse to the mineral veins when the trend of the coast was across them, making offsets in the bearing of the side lines to or from the coast as its general varying distance required, neglecting all but important turns; and when the coast and the course of the veins were more nearly parallel, then making the general line in the direction of the veins, and the offsets transverse. On this general line, when it was transverse, the ends of the locations might be carefully marked and numbered, and the sides when it was parallel to the veins; and it would be the duty of any claimant for a location to identify his position by a reference to this general government line. The most convenient distance for the position of this general line from the coast would be a subject for consideration. It should be sufficiently far to avoid the interruption of all bays and inlets of minor importance, and sufficiently near to obviate any extraordinary amount of difficulty or expense on the part of those who may have to fix their localities by carrying their boundaries up to it. To run the general lines properly, would require the skill of the best land surveyors of the Province; for the bearing of every one would have to be determined astronomically, there being no dependence, as I understand, on the magnet, in consequence of the great amount of disturbing local attraction experienced in almost every part of the country.

The objection that may be raised against this plan would probably be on the score of its costliness; and it would be for the Government to consider whether the necessary outlay would be justified, before it has been proved that the shores of Lake Superior are to become a great permanent mining region.

Under the circumstances, it may become expedient for the purpose of determining the boundaries of that limited number of locations which the Government may deem it prudent to grant, with a view to further the proofs of the mineral character of the country, to adopt a procedure which will be found to reduce itself to a modification of the plan. It would be in each location separately, first to determine as nearly as possible the course of the mineral vein, and by it to decide upon the directions of the lines; then to run a line across the breadth of the lot, and by it ascertain and mark where the side lines came out upon the coast. If the coast were oblique to the line measured across the lot, then the length of the lot might be described as starting from the termination of one or other of the side lines, as might appear most nearly to give the full quantity of the lode. These locations might, no doubt, interfere with the symmetry of any general plan of divisions, subsequently adopted, but it appears to me this circumstance could be of very little practical importance.

The Committee of the Honorable the Executive Council, will be so kind as to consider that in what I have said of the Shores of Lake Superior, I have been speaking of a country with which I have yet no personal acquaintance; whatever opinions of it I entertain are founded on information derived from others; on viewing it with my own eyes, there may be found occasion to modify some of them. That a geological examination of it should be instituted as soon as convenient, appears to me expedient, and in proposing to visit it the ensuing season, I understand I shall shall act in conformity with the wishes of the Government.

A desire seemed to me to be indicated by the Committee when I had the honor of attending on them, that I should aid in determining the boundaries of such mining test lots as the Government may deem it expedient to grant at the present time. It would depend on the number of these, and the size of each, whether the aid it might be in my power to render would materially interfere with the rapidity required to effect a general examination of the Canadian shore during the season. But it would in my opinion be of advantage to the public service, and economize time, if a Provincial land surveyor and his

assistants were united with me on the expedition. After the direction of the lines should have been determined, the land surveyor might run whatsover of them were required, and while he was thus engaged, the examination of the geological character of the vicinity might occupy my attention. The services of a sworn Provincial land surveyor would be of further value from the fact, that his work, in case of need, would be recognized as of some weight in a court of law; and should any minerals of value be discovered and worked on a granted location, a strict and legal definition of its boundaries, made in all due form, may be of some consequence.

According to the best information I have been able to collect, the expenses of navigating on Lake Superior will be greater than they have been found in other parts of the Province. The absence of traffic will render it difficult to transport such specimens as may be required to illustrate the geology of the country, and such as it may be necessary to analyse for the purpose of ascertaining economic results. The room in our canoes, or whatever craft may be employed, will therefore be of value; and it appears to me it would be but fair that the charge of conveying the land surveying party should not fall upon the funds provided by the Province for the geological part of the work.

The mining experiments now in progress at Keweenaw Point, in Michigan, will, without doubt, display many facts which it would be of great value to know; and it appears to me, a visit to the spot would much facilitate the subsequent examination of the Canadian shore. In any instructions, therefore, with which I may be favored, it would perhaps be advantageous to leave it within my discretion to effect such a visit, if it should be deemed fit, and can be done without a great expenditure of time.

MONTREAL, *24th March*, 1846.

(Signed,) W. E. LOGAN,
Provincial Geologist.

REPORT

ON

TWENTY-SEVEN MINING LOCATIONS

ADDRESSED

TO THE COMMISSIONER OF CROWN LANDS.

REPORT

ADDRESSED TO THE

COMMISSIONER OF CROWN LANDS.

MONTREAL, 12th *January*, 1847.

SIR,

In conformity with the instructions you did me the honor to transmit to me on the 12th May last, by command of His Excellency the Governor General, I proceeded, towards the end of the month, to Lake Superior, for the purpose of making a general geological inspection of its British shores, and of assisting to place such mining locations as might be claimed under the various exploring licenses, twenty-seven in number, of which a list was enclosed with your communication.

Accompanied by my assistant, Mr. Murray, and by Mr. M'Naughtan, the provincial land surveyor, appointed by you to determine the admeasurements, and topographically delineate and describe the locations, the party arrived at Sault Ste. Marie on the 11th June. Having determined to commence our operations at the highest point of the Lake at which locations might be claimed, and work downwards, in order that we might be drawing nearer home as the season advanced, the chief part of our men were forwarded to Fort William, in the "White Fish," a schooner belonging to the Hudson's Bay Company, while we arranged to proceed to the same point by a propeller to Copper Harbour, on the south side, where we hoped to have an opportunity of inspecting some of the Michigan copper mines; and thence by a vessel across the Lake. We reached our destination on the British side on the 10th July, only a few days after the arrival of the "White Fish," and immediately proceeded to work on the task assigned us.

A description of the geological character of the country will hereafter be furnished the Government, in the report of progress

in the survey of the Province it is my duty annually to place before His Excellency the Governor General. A topographical delineation of the locations measured and assigned to claimants will be found in Mr. M'Naughtan's diagrams (this moment received,) accompanying the present communication. His field-notes, and his written description of remarkable objects by which abutments of boundaries upon the coast are to be recognized, will be forwarded so soon as they reach my hands.

The duty devolving on me, in placing these locations, more immediately referred to such geological facts as might have a bearing on the probable direction of their boundary-lines, which, in cases of collision or interference in neighbouring locations, it was left within my discretion to adjust in such a manner as might in my judgment be consistent with the general interest.

The Government having determined that each location should consist of an area of ten square miles, assigned to it a length of five miles by a breadth of two, with the intention that the length of the location should, as nearly as possible coincide with the direction of the mineral veins, apparently considering it for the interest of the discoverers, as undoubtedly it is, that they should be allowed a greater measurement on the run of their lodes than across them. With the impression that each claimant would be sufficiently awake to his own interests to ascertain the facts of his own case, it was expected he would be prepared to point out the course of the veins on his location, thus aiding its geological examination; and concluding, that, as in other countries, the metalliferous veins discovered would be found to possess an average degree of uniformity in their courses and parellelism, it was conceived the facts which might be ascertained, would afford some rule by which to establish the best direction for lines of boundary in a future general symmetrical division of the region into mining locations, should its mineral importance be found sufficient to authorise the expense.

By reference to Mr. M'Naughtan's maps, it will be observed, that, commencing at the British boundary, on Pigeon River, seven locations have been placed between that point and Fort-

William. In the order in which they succeed one another on the coast, they are the locations of

1, John Stuart.
2, James B. Forsyth.
3, O. D. M'Lean.
4, W. B. Jarvis and others.
5, John Prince.
6, Charles Bockus and Donald Ross.
7, George Desbarats.

Several of these locations adjoin, and they are all parallel to one another. The whole of the parties claiming them agreed precisely in the longitudinal direction indicated as coincident with the mineral veins; and it was therefore deemed expedient to assume the direction as correct. This direction is nearly at right angles to the general run of the coast; and if it had been precisely so, it would probably still further have approximated the truth in regard to that system of mineral veins, on which chiefly the claimants appear to found their expectations of metalliferous results.

The district in which these locations are situated, consists of argillaceous shales or slates, overlaid by a flow of trap, all displaying a general dip towards the coast at an inclination of about fifty degrees. Both slates and overlying trap are cut by a great collection of parallel trap dykes running with the strike, and also with the coast, of which they have modified the form, and determined the general direction, which is about N. 55 E.; and coinciding with the bearing of these dykes, there is a set of veins which are occasionally observed to carry some of the ores of copper. Both the dykes and these veins are cut transversely by a very conspicuous system of spar veins, consisting usually of a combination of calcareous spar, heavy spar, and amathystine quartz; and it is upon the run of these that the locations have been longitudinally placed. One of these spar veins is decidedly metalliferous, and is strongly marked up to the very surface by the presence of some of the ores of copper. It is the character of this vein which has attracted attention to those parallel to it. The combination of earthy minerals being the same in the whole, it is inferred by the claimants that the whole

will prove similarly metalliferous. But the absence of such strong surface indications in all but the one, (though there are occasional specks of copper ore in some of them,) suggests the possibility that this one may be an exception to instead of an example of the rest; and induces a hesitation in recommending the course of these veins for the longitudinal direction of the locations in this part of the country in any general plan of future division, until farther and deeper trial shall have been made upon them by the operations of the miner. The facts ascertained up to this time concerning them, are not quite sufficient to authorise either the assertion or denial of their general metalliferous quality, or to conclude whether the less conspicuous veins, running with the dykes, may not be proved by farther experience to be in the true metalliferous course; in which case the proper longitudinal direction of the locations would be with the coast, and nearly at right angles to those surveyed in this part.

Proceeding along the coast, the next set of locations are those of

8, Joseph Woods.
9, Stewart Derbishire.
10, Abner Bagg & Stanley Bagg.
11, John Ewart.
12, W. H. Merritt.
13, S. J. Lyman.

The longitudnal direction of the whole of these, with the exception of Nos. 8, and 9, which last is confined to a small group of Islands, is at about right angles to that of the previously mentioned set.

The Pigeon River slates and overlying trap are suddenly cut off, about five miles eastward of Thunder Cape, by a transverse dislocation; and a later formation, consisting of sandstones, limestones, and indurated marls, interstratified with, or overlaid by trap, let down by it, constitutes the coast and islands to the north-eastward. As in the case of the lower formation, these rocks are cut through by a multitude of trap dykes, a continuation of those to the south-west, running about parallel with the general trend of the coast. In this instance,

however, the metalliferous lodes appear clearly to coincide in direction with the dykes and strike, with the exception of that which occurs in No. 8. This has some probable connexion with the dislocation which has been mentioned. It apparently belongs to the Pigeon River system of spar veins, and parallel with them, the course is north-westward. The longitudinal direction of the location, however, as claimed and surveyed, has not been made to coincide with the course either of this vein, or of those which have guided the direction of the locations numbered after it; it was partially oblique to both, in the bearing of a five-mile fragment of the coast at the extremity of Neepigon Peninsula, out of the great general trend, at an acute angle to the dykes, and the strike of the strata. But as no locations were claimed immediately near, to interfere with its boundaries, I did not consider that it came within the compass of my instructions to effect any alteration in its direction.

The length of the locations Nos. 10 to 13, inclusive, runs with the metalliferous veins, and is in perfect accordance with the intention of the Government.

The succeeding group of locations are those of

14, James Ferrier.
15, S. B. Harrison.
16, James Hamilton.
17, Peter M'Gill and others.
18, R. J. Turner.
19, James Wilson.

The country over which these are spread is a continuation of the same series of arenaceous, calcareous, and igneous rocks, which support the previous group. But the present group is classified separately, in consequence of a bend that occurs in the direction of the dykes, of the sedimentary and igneous strata, and of the coast, the whole of which still preserve their relative parallelism to one another. From Pigeon River to a point about five miles eastward of the upper end of St. Ignace Island, the run of these is about N. 55 E. they then bend round to a direction nearly due east. The cupriferous veins turn with them, and the bounding lines of the locations have been modified in their bearings accordingly

by the claimants. But the longitudinal direction of Nos. 15 and 16 on St. Ignace Island, and No. 18 on Simpson's Island, have been chosen transverse to the veins. This, however, happens to suit well with the configuration and dimensions of the Islands.

From No. 19, which is on the middle island of the Battle Group, no locations have been claimed, until reaching Michipicoten Island. On this two have been surveyed, one at each extremity, namely, those of

20, Charles Jones.
21, Angus M'Donell.

The Island of Michipicoten, like the Neepigon Peninsula and its adjacent Archipelago, is composed of sandstones, occasionally passing into conglomerates with inter-stratified and overlying beds of trap. Few or no trap dykes are met with. The general dip of the strata is a little to the east of south, and the metalliferous veins appear to run, for the most part, nearly at right angles to the strike. The directions of the bounding-lines of the two locations having been claimed oblique to one another on the opposite sides of a north and south line, with a view to a future symmetrical division of the island, Mr. M'Naughtan was instructed to run them N. 5 W.; but the length of No. 21, at the lower extremity, is transverse to the apparent metalliferous courses. The breadth of the island, however, being there less than five miles, I have not considered the matter to be of sufficient importance to effect any change.

The remaining locations may be classed together. They are those of

22, Thomas Ryan.
23, Arthur Rankin.
24, Edward Ryan.
25, John Douglas.
26, Allan M'Donell.
27, W. C. Meredith.

The first of these is claimed at Cape Gargantua, and the remainder at Pointe aux Mines and Mamainse. None of them have been definitively surveyed and allowed. Cape Gargantua

had been passed both by my own party and that of the Provincial land surveyor, before the claim for No. 22 was lodged, the claim not having been presented to me until my return to Sault Ste. Marie; whilst, in regard to the locations claimed in the vicinity of Pointe aux Mines and Mamainse, several circumstances conspired to render a postponement of their final adjustment not only expedient, but unavoidable.

As laid down by the claimants, several of the locations overlap and interfere with one another; and to the longitudinal direction of no less than the whole five, different bearings have been given. That an adjustment of the claims would be required was very evident; but, in regard to three of them, Nos. 25, 26, and 27, no agents of sufficient authority were present to discuss the subject, and to point out which parts of the locations were considered most improtant. In respect to two of them, Nos. 25 and 26, though a sketch from Bayfield's Chart, on a small scale, without actual admeasurements, had been furnished, no point of departure had been indicated in the description to enable a land surveyor to understand where his lines were to commence. The season also being far advanced before the land surveyor could reach the vicinity, I directed him to limit his work to a measurement of the whole coast, comprehending the claims; and to mark, as nearly as he could, the points at which the various bounding lines abutted on the coast, with a view to the construction of an accurate map, to enable such a division of the surface, and arrangement of the claims to be arrived at, as the Government might consider just.

The rocks composing Cape Gargantua, and the coast adjacent to Point aux Mines and Mamainse, are much of the same quality in both localities. They are of a granitic, or gneisoid order at the base; and upon the granite reposes, conglomerates, and interstratified, or overlying trap floors. Trap dykes occur, cutting the whole; but there is sufficient irregularity in their bearings to render it difficult to say which is their master course.

Those which came under my observation, appeared to have two prevailing directions—one to the west of north, and the other to the south of west; the latter being in the direction of the dip of the strata, which are tilted to a considerable angle.

It is not surprising, that there should be some discrepancy in the direction of the bounding lines claimed for the locations; for the metalliferous veins on this side of the lake exhibit a little more complication than in other parts. One well marked vein, by the side of a trap dyke, runs to the west of north, much in the direction of the neighbouring stratification. The course of others is partially oblique to the strike, for short distances; but it appeared to me, that the main bearing of the principle lodes is in the dip and rise of the strata, running about N. 70 E. to N. 75 E.

Some of the locations were claimed with the length in this bearing (N. 73 E.); and as such would be in accordance with the intention of the Government, and with such a division of the surface as would give all the claimants room to have their locations abutting on the coast; it seems to me the one most consistent with the general interest.

To say that the metalliferous courses given as connected with the twenty-seven locations that came within the scope of my instructions, are an infalliable index of the general directions the copper bearing veins will exhibit, wherever they exist on the British shores of the Lake, would be hazarding more than the neccessarily rapid nature of the examination will authorize. The locations have, as yet, been but partially explored, and, in general, it is only that portion of them resting on the water, which has been subjected to scrutiny. No serious contradictions, however, to the evidence they afford, have been observed on other parts of the coast, the whole of which has been cursorily inspected; and it appears to me enough has been ascertained to make it probable something approaching the true average run of the lodes may be predicated. Commencing at Pigeon River, they seem to hold a course about thirty five degrees to the north of east, as far as St. Ignace Island; they then assume a bearing nearly due east, maintained to the eastern-most island of the Neepigon Archipelago; while on the east side of the Lake they turn up about twenty degrees north of east. When exceptions to these courses occur, the lodes are found to be at right angles to them.

I have, &c.

W. E. LOGAN,

Provincial Geologist.

The plans of Nos. 1, 8, 20, and 21, are still incomplete. They will be forwarded so soon as received.

MONTREAL, *26th February*, 1847.

SIR,

In compliance with your request of yesterday's date, that I would state my opinion in respect to the course of the metalliferous veins in the vicinity of Isle Verte, on the shore of Thunder Bay, in Lake Superior; I have the honor to inform you, that those veins holding metal, which came under my observation in that neighborhood, appeared to run about N. 50 E.; or in general terms with the coast, taking Bayfield's map as truly representing the shores of the Bay.

They seem to me to belong to that system of veins which, in the general report, I had the honor to transmit you on the Lake Superior mining locations, is described as coinciding with the dykes and stratification from Pigeon River to St. Ignace Island, whose average course is considered to be about thirty-five degrees to the north of east.

I have, &c.

W. E. LOGAN,

Provincial Geologist.

To the Hon. D. B. PAPINEAU,
Commissioner Crown Lands.