

GEOLOGICAL SURVEY

OF

CANADA

ERRATA

- Page 23, line 16th from the bottom—for “*south* side,” read “east side.”
“ 35, “ 2d from the top—for “*S. 27° E.*” read “*N. 73° E.*”
“ 35, “ 6th “ for “*westward*,” read “northward.”
“ 37, “ 20th “ for “*bifusate*,” read “bifurcate.”
“ 49, “ 5th “ the course, “*320°*,” should be “*310°*.”
“ 49, “ 21st “ “ “*235°*,” “ “*325°*.”
“ 49, “ 24th “ “ “*345°*,” “ “*315°*.”
“ 60, “ 4th “ for “*saccicava*,” read “saxicava.”
“ 65, “ 15th from the bottom—for “appears to the *N. 60° E.*,”
read “appears to *be N. 60° E.*”
“ 72. “ 8th from the top—for *martin*, read marten.



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GEOLOGICAL SURVEY OF CANADA.

REPORT OF PROGRESS FOR THE YEAR 1844.

MONTREAL, 1st May, 1845.

SIR,

I have the honour to request that you will do me the favour to place before His Excellency the Governor General the accompanying Report of the progress made in the Geological Survey of the Province in the year 1844.

I have the honour to be,

Sir,

Your most obedient humble servant,

W. E. LOGAN,

Provincial Geologist.

To the Honourable D. DALY,

Provincial Secretary,

&c. &c. &c.

TO HIS EXCELLENCY
THE RIGHT HONOURABLE
CHARLES THEOPHILUS BARON METCALFE,
OF FERNHILL, G. C. B.,
GOVERNOR GENERAL OF BRITISH NORTH AMERICA,
AND
GOVERNOR IN CHIEF
IN AND OVER THE PROVINCES OF CANADA, NOVA SCOTIA, NEW
BRUNSWICK, AND THE ISLAND OF PRINCE EDWARD,
AND VICE ADMIRAL OF THE SAME, &c. &c. &c.

MONTREAL, *1st May*, 1845.

MAY IT PLEASE YOUR EXCELLENCY,

In conformity with the terms of the Act passed in the last Session of the Provincial Legislature, making provision for the continuance of a Geological Survey of Canada, it is my duty to place before Your Excellency a Report setting forth generally the progress made in the investigation during the past season: and as the Act in question contemplates also a final, full, and scientific description of the rocks, soils, and minerals of the country, properly illustrated by maps, diagrams, and drawings, after the Survey shall have been completed, it will perhaps be sufficient, in reporting progress, that I should confine myself to a simple narration of the facts ascertained, without at present deducing from them any general conclusions of a purely scientific nature, or doing more than will be necessary to render intelligible such parts of the subject as may have an immediate bearing on matters of economic importance, whether of a positive or negative character.

With a view of prosecuting the examination of the Gaspé and Bonaventure Districts, in continuation of the previous season's

operations, I left Montreal on the 27th May last, accompanied by my Assistant, Mr. Murray, and, embarking on board of the Unicorn steamer at Quebec, we reached Gaspé on the first June. Losing no time there beyond what was required to provide ourselves with Indians, canoes, and provisions, and to rate our chronometer,—for which purpose the place offered a good opportunity, being marked as one of his Observation Stations by Captain Bayfield in his admirable hydrographical charts of the St. Lawrence,—we commenced our investigation at Cape Rosier, and coasting upwards along the South Shore of the river as far as Cape Chat, a distance of about one hundred miles, every spot was examined where favorable sections promised to give us an opportunity of ascertaining the true nature of the rocks.

The Coast country between Cape Rosier and Cape Chat is of a mountainous character; the ridges in regular succession run in towards the interior at a very small angle with the trend of the shore, and with the exception of nine miles between the first mentioned point and L'Ance à Griffon, the hills in general come close upon a rocky and precipitous margin, leaving very little space for settlement, beyond the narrow flats at the mouths of the principal streams that descend from the highlands to the St. Lawrence. These are in general occupied by fishing establishments of more or less importance, and among the principal are those of the Great and Little Fox Rivers, and those of the Magdalen, the Mont Louis, the Ste. Anne, and the Chat. On the chief part of these flats there is not much room for agricultural labour, and the inhabitants, wholly engaged in fishing, depend for their supplies on importations from Quebec, which appear to find their way by Gaspé and Cape Rosier; and provisions become dearer, the closer we approach Quebec up to Cape Chat.

Reaching the Ste. Anne River, the land immediately on the St. Lawrence assumes a less rugged aspect than lower down. There, as well as on the Chat, some few signs of cultivation make their appearance, and a small amount of arable land existing in the vicinity would permit its further extension.

The Magdalen, the Mont Louis, and the Ste. Anne present the only harbours along the coast. That of the Magdalen is the safest to lie in; and, if it were not for a sand bar in front, there would be water enough for larger vessels than the class of schooners frequenting it. That of Mont Louis gives good shelter to small

coasters; while that of Ste. Anne, though possessed of deeper water than the others, is difficult of ingress and egress, there being a dangerous rock just at the entrance. Large vessels are occasionally built there, and one of 340 tons burden was on the stocks when we visited the place; but such a vessel could not be fully loaded in the harbour, there being only twelve feet of water on the bar in Spring-tides.

The Chat affords no shelter for vessels of any description. On the Cape there stands a conical hill 366 feet high, and about three miles lower down, the stream joins the St. Lawrence in the bight of a shallow bay bounded to the eastward by a low point, which is covered with sand above high-water mark, but juts out into a ledge of rocks laid bare for several hundred yards at the ebb of the tide. A current which comes obliquely across the St. Lawrence from the opposite side, at a constant rate of one to two knots an hour, and makes upon the shore, renders this point, and the whole vicinity, dangerous to the navigation; and the hull of a fine transport called the Premier, cast away the previous autumn, on a homeward voyage with a large number of troops, and lying on the reef, after having been once raised in the spring and again stranded during a heavy gale which occurred while we were on the spot, afforded a melancholy proof of the perils of the coast, and the insecurity of the bay.

At the mouth of the Chat there is a small lagoon, dry at low water, which is separated from the Bay by a narrow barrier of clay, sand, and gravel, and from this looking across the lagoon up the valley of the stream, we had a striking view of the majestic mountains of Notre Dame, which reared their lofty heads to the south, and which it was our intention to pass in a line of exploration to the Bay of Chaleur as near to a straight one across the strike of the stratification as circumstances would permit.

As the country on the line of our intended route had never before been mapped or in any way examined, and as at the same time correct geographical details were indispensable to the attainment of accurate geological results, and to the intelligible exhibition of them, it became requisite that our journey should be made as much available for a topographical survey as for the examination of the strata. With this in view we measured a base line on the shore, and determined by triangulation, using for the admeasurement of our angles one of Cary's excellent pocket sextants dividing to

thirty seconds, the position of several well marked peaks in the barrier of hills before us; and having fixed the number we considered sufficient, we proceeded up the Chat river in our canoes, dialling our course as we went, and registering a description of the place, quality, and attitude of every rock we met with. In dialling the stream, we used a Smallcalder's prismatic compass to determine the bearings, and Rochon's micrometer to measure the distances; and as this latter instrument, while it is an admirable one for the exploration of rivers in a new country seems at the same time to be little known in Canada, I am induced to draw particular attention to it. Its construction is very simple. A moveable refracting lens attached to a vernier, which slides in a graduated slit along the tube of a telescope and must pass over a considerable space to produce a very small refraction, measures to the accuracy of one second the angle subtended by a known length between two bars or balls on a staff; and the distance of the staff from the observer is found by reference to a table which gives the distance for every angle within the range of the instrument, subtended by one foot. This multiplied by the number of feet between the bars on the staff used, will give the distance required. In the calculation it is of course necessary to take into account the index error, making allowance for it as in the case of a sextant, and this error must be determined by experiment in the first instance, before putting the instrument to use. A surveyor with two canoes and four Indians could, without difficulty, on a stream which presented no peculiar obstructions, accurately measure twenty miles a day, and perhaps more, if his object were to ascertain geographical features only. The rapidity of his progress would much depend upon the lengths of the sights, and therefore on the breadth and straightness of the river; for it takes very nearly the same time to observe for the measurement of one hundred yards as for that of a mile, and the chief difference on the whole work of the two cases is the difference of time in moving from one station to another. Mr. Murray and myself occasionally worked out twelve meandering miles in a day in fifty or sixty sights, registering, in addition to our bearings and angles, an exact account of the place, quality, contents, and attitude of every bed of rock, in every one of the reaches of the stream we were upon, stopping occasionally to make barometrical observations for the determination of heights, and giving time to our men to refresh themselves with a meal. Our mode

was to keep one canoe in advance of the other as far as the bends of the river would permit. In one was the staff, in the other the micrometer, with a prismatic compass in each. The staff was furnished with three bars, the uppermost five feet from the lowermost, and the intermediate one dividing the five feet into spaces of four feet and one foot, the latter for the measurement of short distances. The micrometer angle determined, a forward and backward bearing was taken. Signals were made when the observations were concluded, and the first canoe might wait for the second if it were necessary to communicate any remark, or, proceeding forward, leave a token to indicate the spot which it had occupied, and was to be assumed by its follower for another observation.

The accuracy attainable by a careful use of these means is perceptible in the result of our measurements across from the St. Lawrence River to the Bay Chaleur, after having been mapped on the scale of an inch to a mile. We dialled the River Chat, and having by means of bearings fixed the peak of a mountain towering 2669 feet close over its left bank; from the summit of this, and the summit of one of the peaks fixed by means of our base line on the shore of the St. Lawrence, and visible from the other, we triangulated a conical peak seventeen miles forward, on a stream flowing into the Bay Chaleur. Walking across to this mountain, through the forest, we again took to water and dialled our way to the Bay. The whole distance, following the windings of our course, is upwards of one hundred and eleven miles, but in a straight line, according to our map, it is seventy-four miles and sixty chains. The same line as determined by the latitudes and longitudes of its extremes, taken from Bayfield's accurate charts, is seventy-four miles, seventy-nine chains, and as shewn by Deputy Surveyor General Bouchette's new map, about to be published, it is seventy-five miles, ten chains. The bearing of the line so nearly coincides in all the three that the difference is scarcely perceptible.

The distance measured on the Chat, before it became necessary to abandon our canoes, was thirty-two miles and a half, following its curves; and twenty-five miles and three quarters, taking the general course of the valley. This carried us clear across the range of Notre Dame, which rises up at a distance of twelve miles in a direct line from the margin of the St. Lawrence, and

occupies a breadth of six more. The stream cleaves these mountains to their very base, and at the point where we left it, the height of its bed above the level of the sea, we found to be 587 feet, after ascending two small falls in the mountain gorge, one of ten feet and the other of sixty, giving a slope of eighteen feet in a mile for the water, and twenty-three feet in a mile for the valley of the stream. The breadth of the Chat at our last station on it, was between fifty and sixty feet, while at the mouth it was about one hundred and fifty feet. Its course between these two points, without attending to minor curves, in a downward direction, is as follows, the bearings being magnetic, and the variation $22^{\circ} 30'$ west:—

Miles. Chains.		Miles. Chains.	
1 N. 10 W.—1	40	7 N. 11 E.—4	28
2 N. 11 E.—0	56	8 N. 8 E.—2	25
3 N. 12 E.—1	12	9 N. 6.2 E.—2	70
4 N. 24 E.—0	70	10 N. 80 E.—1	7
5 N. 7 W.—3	03	11 N. 18 E.—1	35
6 N. 67 E.—5	56	12 N. 75 W.—0	66
Total distance 25.68.			

At every elbow made by these courses, with the exception of the last three which are through soft ground, a tributary of more or less consequence joins the stream; but the farthest sources of the river take their rise in a flat ridge about three or four miles south of the Notre Dame Mountains, which is much lower land, and constitutes the water shed between the St. Lawrence and the Bay Chaleur, over an extent probably ranging, both to the east and to the west, far beyond the Chat, which does not embrace more than twelve to fourteen miles of it. The waters of these sources are brought to the mouth of the deep mountain gorge by three main streams, all meeting at a point just there; two of which running in exactly the same line, but in opposite directions, are in the strike of the stratification, and mark the boundary of the Notre Dame formation, while the third makes a partial section nearly at right angles to the others, across the strata which lie upon those rocks to the south.

The whole area unwatered by the Chat may not exceed three hundred square miles. Nearly one half of this lies to the south of the great mountains, or among them. These send their tribute chiefly through two deep longitudinal valleys, immediately opposite to one another, in the strike of the range, which extend

about six miles on each side of the gorge, and emptying into it, are terminated by two master summits at their extremities, thirteen miles in a straight line asunder, while several transverse valleys assist the others in carving the mountain mass into a considerable number of lower but important tops.

Both the principal summits we visited. In ascending the eastward one, which stands exactly opposite to the lower part of the valley of the Chat, and seems to terminate it, looking from the St. Lawrence, we clambered up the north side of the range, which presents a face whose slope cannot be much under 45° . for 3000 feet; and we found that before the horizon was clear over the lower ridges between us and the great river, we had attained the elevation of 1753 feet above its surface. The highest spring of water we could discover, which was an abundant one of excellent drinkable quality, coming from the strata at the upper base of the peak, was 3544 feet up. The summit peak itself, a bare pointed rock, was 3768 feet, while the broad flat top of another mountain summit, two miles to the westward, which went among us by the name of Mattawees (the Miemac word for a porcupine)—from our having killed one of these animals as we scaled its side,—and on which we rested the first night of our ascent, having reached it by mistake, was 3365 feet. A deep ravine separated Mount Mattawees from the main peak, and another one severed it from a dome-shaped top nearly its own height, about a mile and a half to the westward, between which and the gorge of the Chat stood another gigantic boss.

The main summit to the westward of the Chatte, to which we gave the name of Bayfield Mountain, in honour of Captain Bayfield, who on one of his Charts has indicated its position, we ascertained to be 3471 feet, after having reached it by a very steep and fatiguing ascent from the gorge to a precipitous mountain knob, 2669 feet high,—which acquired the title of the Old Man, from the existence of an erect stone in a step at its edge, in the position of one watching what might be passing below—and a journey along the ridge of a triple-topped hill over 3000 feet high, separated from Mount Bayfield by two ravines, and an interposed mountain of more moderate elevation.

All these heights given between the two extreme summits, are the links of a chain standing on the north side of the longitudinal valleys which have been mentioned, and while they constitute the

most elevated serrated ridge, none of them are much more than a mile from the northern base of the whole belt. The five miles which compose the remainder of its breadth, present summits of more moderate height, and one of the most elevated of these, which stands conspicuously protruded into the gorge on its east side, and was named the South Mountain, we found to be 2413 feet. The whole of these, as well as the northern crest, are abrupt on the north side, and in general more sloping on the south, in the probable direction of the dip of the strata; and these, as indicated by the ridges, have a strike which in this part of the range may be considered E. N. E. and W. S. W., magnetic.

From the highest summit we visited, the panorama displayed was of the grandest description. In the northern half of the circle, the waters of the St. Lawrence, dotted with its ships and fishing boats, spread out to the right and to the left as far as the eye could reach. On its northern shore, immediately in front, unaided vision could plainly distinguish the lighthouse of the Pointe des Monts, some fifty miles off, from which the granite hills rising immediately behind it in the interior, gradually sunk below the horizon as they receded from us, following them down the expanding gulph, to a point where we thought we could discern the Island of Anticosti, one hundred miles away in the mist of the distance, while at our feet were arranged in parallel lines the ridges and valleys of the lower land between us and the river. To the eastward a confusion of mountains and ravines belonging to the Notre Dame Range, filled up several degrees of the circle, and one summit which exhibited a patch of snow, we supposed might be higher than the point we stood upon. Many of the peaks were bare, and as they retired one behind another, and occupied a smaller angle in the perspective, it became difficult to distinguish those of the Notre Dame from such as appertained to other ranges. Turning southward, a sea of parallel undulating ridges occupied the picture, the more distant of which we conceived might present a table land, with a few marked points rising in cones and domes; and through one gap, which probably was the valley of some south flowing river, we distinguished a faint blue horizontal line, which we fancied might be in New Brunswick. Prominent points became still fewer, veering westward, until the horizon was again interrupted in that direction by a well defined outline of a not very distant part of the range from which we looked.

The highest summits within our view were generally bare rocks. Those next in the scale were crowned with sturdy dwarf spruce trees, many of them not five feet high, but springing up so close together that their branches interlocking, rendered it very difficult to make way among them. On those still lower, spruce became mingled with white birch, and the size of the trees gradually augmented in proportion to the decrease of elevation. One feature in the vegetation high up in the hills, that struck us forcibly and gave us much satisfaction after confinement in the forest below, was the great extent of open glade that appeared on all sides but the north. Wide slopes on the east, the south, and the west, were carpeted with the most luxuriant growth and abundant specific diversity of ferns, from which clumps of spruce or of white birch, or of both mingled, started up here and there, giving the hills occasionally almost the character of park scenery, as if art had arranged the distribution with a view to ornament, and often producing, in combination with peaks, ravines, and a distant horizon, landscapes of a very pleasing description.

On the hills on the banks of the Chat and in the low grounds, the timber consists chiefly of spruce of good size, balsam fir, white cedar, and white birch, with occasional poplars in wet places, and a frequent fringe of alders on the margin. Maple is scarce: we saw only one grove of a size fit for sugar trees, and this was at the north base of the Mattawees Mountain, where we commenced our ascent. White pines were not wanting, though not over abundant, and it was evident to us that the lumberer's axe had never tried its edge upon them. Ascending the stream we saw trees enough close upon the water to furnish a good stout cargo without any haulage, and in the space of a mile back from it in one place were counted twelve good long stemmed trees, measuring from nine to ten feet round at five feet from the ground, and thirteen trees of the same size in another.

The small number of rapids and cascades in the Chatte would render it an excellent stream for *driving* lumber, and if there were a good port in its vicinity, what with pine for square timber, spruce for saw logs, and white cedar for shingles and lathwood, a few cargoes might be got out profitably.

The soil of the Chat above its mouth is of a light description, consisting of sand and gravel; but I greatly doubt whether there is much soil at all on the hill tops and sides. The low parts, such

as the meadows on the brooks, might perhaps yield some fair grass land if cleared; but the valley is narrow, and the quantity of this can be but small.

Abandoning our canoes on the Chat, the general course of our pedestrian journey through the forest across the water shed between the St. Lawrence and the Bay Chaleur to the Conical Mountain fixed by triangulation from Notre Dame Range, was about S. 40 E. The distance in a straight line was about twelve miles and a half, but the deviations of our route increased it to thirteen miles and three quarters. The position of intermediate stations we determined by counting our paces, making allowance for minute zig-zags and disturbing obstructions as they occurred, and checking our calculation by bearings and angles on the peaks from which we were receding, taken from the summits of high trees wherever the slope of the ground favored us with an opportunity. These successive points were regularly mapped, and we were thus always prepared to indicate the direction to be taken, trusting to the sagacity of our Indians to keep a straight line after the course had been given them. By this means we came with precision upon our Conical Mountain, though we did not get a sight of it until within a couple of miles of its base, and we were rather surprised to find with how much accuracy our paces had measured the distance.

After rising in the space of a mile to the brow of the slope bounding the Chat, which we found to be 1204 feet above the level of the St. Lawrence, the surface over which we travelled up to the dividing line of the waters, had a very gentle ascent of about eighty feet in a mile in the direction taken which would produce about one hundred and twenty-five feet in a mile at right angles to the run of the ridge. The chief inequalities of the ground resulted from a few sudden narrow gullies of 100 to 150 feet deep, constituting water courses, of which those in the first half of the distance belonged to the St. Lawrence and those in the other to the Bay Chaleur. The barometrical heights determined as we proceeded were 1264 feet; 1194 feet on the edge of a water course; 1500 feet on the top of a sloping step, beyond which we saw no more of the northern streams; 1707 the summit level; 1630 feet on the margin of the first stream flowing southward; 1608 feet; and finally 1167 feet on a brook at the northern base of the Conical Mountain, after a sudden descent of

about 200 feet. The height of the apex of this mountain, which consists of trap, we found to be 1910 feet, and from it we had an opportunity of verifying the angles upon it from the peaks of Notre Dame. It gave us also a sight of a considerable stream flowing from the westward, which we had been approaching, and now beheld at its western base and which we rightly supposed to be the Great Cascapedia. Round the eastern base of the Conical Mountain, our descent to the banks of the Cascapedia, through a deep and narrow ravine, was rapid, and on attaining its margin, at a distance of two miles and three furlongs, in a general course of S. 20° W., from the summit, we found that we stood at the height of 651 feet over the waters of the St. Lawrence.

On the surface between the Chat and the Cascapedia, there appeared to us to be evidences of a very thin soil. We saw the solid strata indeed only in two places; but wherever we met with a tree blown over by the wind its upturned roots were almost certain to expose a mass of small angular fragments (often containing fossils) belonging to the rock which must have been close below; and it seemed to me probable that to this want of depth rather than to the chemical quality of the constituents that would have been derived from a more complete disintegration of the rock which was at the same time calcareous, silicious and aluminous, was to be attributed the presence of only those species of trees which are in general considered no great mark of aptitude for agricultural improvement. The ruins of this rock may yield a more promising growth of timber in other parts, but on our line we saw only white spruce, balsam fir, and a few white birch; and it was very perceptible that the two former species were frequently arranged in broad parallel belts, partaking of a north and south direction, nearly monopolized sometimes by the one and sometimes by the other. The fir gave us open woods and easy walking while the spruce groves were very tangled and difficult to penetrate.

Arrived on the banks of the Cascapedia, our Indians in three days constructed three canoes of spruce bark, capable of holding two persons each, and dismissing two of our men, who were desirous of returning to the St. Lawrence, supplying them at the same time with a suitable quantity of provisions, we floated down the stream, dialling its course to the mouth. The whole distance, following all the windings of the river, was sixty-five miles and a quarter: but pursuing only the main grand curves, we first made

two miles and a half in a course a little to the east of south; then eleven miles in a curve rather to the south of east, passing three principal tributaries in a valley of red sandstone; our course then became nearly south, and in this direction three grand sinuous sweeps carried us in about thirty eight miles to salt water. Where the river turned south we had again and for the last time an opportunity of obtaining bearings on the peaks of Notre Dame, from the naked top of a hill 1435 feet above the St. Lawrence, yielding so great an abundance of blue berries and "low-bush cranberries," that we were induced to give it the name of Berry Hill. The stream at its base was 440 feet high.

Down to this turn in the stream we did not observe much change in the character of the timber, which still continued to consist of white spruce, balsam fir, and white birch, with cedar in moist places; but further on, with these species of trees became mixed a predominating proportion of black birch and some pine; but the frequent *lumber landings*, as they are called, both old and new which met the eye, pointed out that the enterprise of commerce had thinned and was continuing to thin down the last very fast. Towards the mouth of the Cascapedia, maple exists in some abundance, and elm and ash are seen in a few places, particularly on a number of large fine alluvial, but still uncultivated islands, which there divide the river into several channels.

Having at the mouth of the river, re-provided good birch bark canoes, at Indian Point, and committed to the care of Mr. Cuthbert, of New Richmond, to whom I feel indebted for the hospitality and attention extended to us, the specimens we had collected, to be forwarded to Montreal, we examined the coast to the eastward as far as Paspebiac, the point at which my investigation ceased last year, where we were most kindly received by Mr. Hardley, the representative of Messrs. Charles Robin & Co., whose enterprising and important fishing establishments on the Gulph coast, are so well known in Canada.

Here separating from Mr. Murray, who was directed to proceed upon an exploration up the Bonaventure River—his Report upon which I have now the honor to transmit to Your Excellency—after a visit to Port Daniel, where, with the kind assistance of Mr. Carter, the West and Middle Rivers were examined for several miles up, I returned to New Richmond. Hiring a canoe and two Indians, the investigation was continued thence westward:

the Bay coast was narrowly examined to Dalhousie; and the River Restigouche to Campbelltown, and thence to the mouth of the Matapedia, a distance exceeding altogether fifty miles.

Ascending the latter river, its rocks were examined as far as the lake of the same name, which is over sixty miles from the mouth, and my operations were greatly facilitated and much time saved to the Survey, by the kindness of Mr. William Macdonald, D. P. S., of New Carlisle, who, in the most obliging manner, lent me the field-book of his exploration and measurement of the river, in which all its turns were accurately laid down, partly on a scale of four, and partly on one of two inches to a mile. It was also on his excellent map of the Bay Chaleur coast, obtained from the Surveyor General's Office, that I depended for upwards of one hundred miles of its topographical details.

The road from Lake Matapedia to Metis, comprising twenty-five miles, was examined on foot, and the readiness of Mr. Russell, D. P. S., to whom is entrusted the superintendence of the Gaspé and Bonaventure roads, in furnishing me with a tracing of the numbers and distribution of the lots, and with other useful information, enabled me to fix various points with accuracy. On reaching the St. Lawrence, operations were interrupted by a severe fall of snow, and it became necessary that I should return to winter quarters in Montreal.

SUCCESSION AND DISTRIBUTION OF THE ROCKS OF THE DISTRICT.

I. CONGLOMERATE LIMESTONE, PILLAR SANDSTONES, AND GRAPTOLITIC SHALES.

The rocks displayed on the south side of the St. Lawrence, the whole way between Cape Chat and the northern base of the hills, standing on the bold finger-shaped promontory of Cape Gaspé, possess characteristics, rendering it expedient in my opinion, to class them for the present in one group. Black bituminous shales, with calcareous sandstones, are more or less associated with the whole; and graptolites, occurring chiefly in the black shales, are the only fossils yet observed, with the excep-

tion of a few broken shells met with in a more arenaceous member of the formation.

To separate the group into its component parts will be a task of very considerable difficulty. For the district through which these range is yet wholly covered with the moss and trees of the forest, which conceal the faces of their escarpments, and while it is thus next to impossible to bring them at once into place by a direct line of transverse section, it would demand a greater expenditure of time than circumstances justify, to follow them up to such a line on the strike, from the localities of their best display, by means of the parallel ridges and valleys resulting from the harder and softer qualities of their lithological composition.

The only direct line of section measured and examined across them all was in the valley of the Chat. But though on the banks of this stream there may be a sufficient amount of stratigraphical exposure to be of essential service in carrying on the range of the rocks, when their relations have been elsewhere ascertained, there is not enough to afford data for determining in the first instance the general character or thickness of the distinct masses, or their succession in the order of superposition. On the St. Lawrence, on the contrary, there is a great exhibition of the strata and they strike out upon it in succession; but they do so at so very small an angle to its trend, that from the lowest rocks in the neighbourhood of Cape Chat to the highest in that of Cape Rosier, there is interposed a distance of one hundred and forty miles, while the same series of deposits occupies but eighteen miles in a direct transverse line to the northern base of the Notre Dame Range of Mountains.

As the rocks come out upon the St. Lawrence they exhibit a very contorted condition. The flexures are numerous, and some of them so violent that serious inversions of the strata occasionally present themselves; and it is frequently very difficult to determine whether the mass under inspection be a new member of deposit, or the repetition of one previously noted. To arrive at accurate results it would be necessary to dial the whole coast, marking with great care the attitude of the strata in succession wherever they are visible, for there is yet no detailed map of it on so large a scale as to render measurements upon it available for geological purposes.

It is uncertain whether the whole of the rocks it would be convenient to class with this group are included in the District which

has been examined; and there being indications that the south side of the St. Lawrence continues to present up to Quebec the same slightly oblique course to the run of the ridges, it is not improbable other divisions may crop out above Cape Chat, which have a lower geological position than the strata in its vicinity.

1. The lowest in the neighbourhood of the Chat are seen at a projecting point of land between it and the Ste. Anne river, where a considerable extent of strata are laid bare at the ebb of tide. The strata are highly tilted, and several dislocations occur; but it can be made out, that, based upon a strong bed of gray oolitic limestone, ten to fifteen feet thick, with a thinner one a short distance above it, consisting of flat calcareous pebbles lying on one another as if carefully packed on their sides, there reposes a mass of thin-bedded, dark-gray, yellow-weathering limestone, separated by thin bands of black bituminous shale, with occasional thicker beds of the shale holding large calcareo-arenaceous nodules or isolated masses, becoming very conspicuous in a considerable bed of bitumino-argillaceous shale at the top, where the nodules or patches sometimes resemble septaria, and are occasionally composed of a dull olive gray chert, weathering to a dingy red, in which the cracks or veins hold a mineral undistinguishable in its general appearance and combustible nature from good sea-coal. These beds may be altogether about 240 feet thick, and they are succeeded by a deposit of argillaceous shales or slates, green for about fifty feet at the bottom, red striped and partially spotted with green for 230 feet in the middle, and green striped with red for 120 feet at the top; and wherever there is a green stripe or spot it is usually accompanied by a black line or speck along the middle or in the centre of it. Upon these shales rests an unequal gray oolitic conglomerate limestone bed, sometimes twenty feet thick, with large flat pebbles and small boulders of gray limestone and gray calcareous sandstone, and occasional crystalized nodules of pyrites, followed by alternating beds of black shale, and light and dark gray sandstones in some of which specks of blende appear; to which succeed green shales striped with black; then very pyritiferous black shales; and alternating with them at the top, thin calcareous sandstones and arenaceous limestones; terminated by another band of gray oolitic limestone conglomerate, and one of gray coarse-grained calcareous sandstone. Including the two limestone

beds which would both yield material for burning, the thickness of this part of the deposit may be about five hundred feet.

The whole of the deposits given amount to about 1140 feet in thickness, and the distinguishing features they present are the bands of conglomerate limestone, and the bituminous mineral so much resembling coal. This is found not only in the septa of the cherty nodules which have been mentioned, but also in many small cracks across the strata, and in more parts than one of the vertical thickness. A similar mineral, in an analogous position, is found in the rocks at Point Levi and Quebec, and in the museum of the Quebec Natural History Society a block of it, procured in the neighborhood, containing about a cubic foot, is preserved. Some have been inclined to suppose that it might indicate the proximity of workable coal, and indeed I have been asked whether a mine upon it, in a position which I have not yet seen, but where according to information received, a cart load of it has been obtained, would be likely to be successful. Now none of the material where it has come before me in situ, bears any analogy in the mode of its occurrence to workable coal. This is always found in extensively continuous beds conformable with the stratification; whereas the mineral in question occurs in cracks cutting the strata across for greater or less distances. It is true that where faults or dislocations exist among coal seams, there is often met with running across the stratification what by Scotch miners is termed a *wise*, and by Welsh, a *leader* of coal, which in general is a thin, confused, irregular interrupted black more or less carbonaceous sheet, conducting up or down, as the case may be, in the plane of dislocation, from the termination of a coal-bed on one side to that on the other; and there is no doubt it is the result of the grinding of the terminal edges of the strata against one another, when the slip producing the dislocation occurred. Without a slip or displacement, therefore, no leader would be found, and none in any case would hold true coaly matter extending beyond the distance between the separated edges of the coal-bed. Now in the case of the bituminous mineral, the cracks in which it occurs are, in many instances, unaccompanied by any displacement of the strata, and in others, where the extent of the dislocation (that is the upthrow or downthrow, as it is called) is visible, no layer holding any of it occurs among the beds. Independent of all this, the formation in which the mineral is found, is an inferior member of a group of rocks, whose place is in all

probability a very considerable distance below the position of the true workable coal-bearing measures, and we are, therefore, not warranted in expecting coal seams to exist in it. The rock is supposed to be the equivalent of a part of the Hudson River Group of the New-York geologists.

The continuity of the conglomerate limestones which have been mentioned, is broken just to the eastward of the extremity of Little Ste. Anne Cape, where the shore turns southward towards the Bay of Ste. Anne River. A fault, visible on the face of the ledges at low water, occasions a probable upthrow to the north-eastward, on which side of it a considerable north-dipping mass of the limestone, tilted up to an angle of 70° , consisting of two beds, measuring twenty-two yards across, forms a knob of rock, which stands above water at flood-tide, and two hundred and forty yards to the southward of which the strata, consisting of thin bedded limestones and calcareous sandstones, interstratified with black and green indurated argillaceous shales, terminated by red shales, first assuming a south dip, sweep round the western extremity of a trough, which is seen to open out to the width of two hundred and fifty yards before it becomes concealed beneath low water mark.

2. What interval there may be between the deposits mentioned and the next to be noticed in which a difference of character is observable, I am not able to say with precision, (though it cannot be great), not having any where found an exposure by which to trace up the connexion. But these consist of a considerable thickness of sandstones associated with some bands of red and a fewer number of black argillaceous slates. The arenaceous rocks are sometimes a little micaceous; they are in general moderately fine-grained, but occasionally a little coarse, and sometimes approach the quality of a fine conglomerate with small pebbles of white quartz, a few of white calc-spar resembling worn crystals, and sometimes a larger number of small flat black ones of indurated bituminous shale, with a few opaque white flakes of a soft character. The rock frequently encloses arenaceous spheres of various sizes up to six inches in diameter, which are of harder quality and lighter colour than the mass. The general colour of the mass is of a greenish tinge in fresh fractures, but it weathers to a drab, and through atmospheric influences the rock becomes fretted and pitted by deep holes or cells of various sizes and shapes, with thin but well marked divisions between them. The stone is rather soft and appears to wear fast, and where the strata are vertical or nearly

so, the action of the sea between high and low water mark cuts them out into pillars reaching thirty feet in height and four or five across, which are sometimes smaller at the base than at the summit, producing occasionally a very picturesque effect in the landscape. Two of these stand near a small fishing station below Ste. Anne, called from the circumstance Tourette and the remains of many more are perceptible in the vicinity.

The red shales bear but a small proportion to the sandstones, and both together compose the coast from Cape Chat to the mouth of the river, a distance of three miles and a half; proceeding along the shore from Mount Chat which stands upon the Cape and is composed of the sandstone dipping south and tilted up to an angle of 40° , four belts of sandstone separated by three of red shale are obliquely crossed in the first two miles, and then two belts of sandstone and one of shale in the succeeding mile and a half. There is no doubt that the last division is a repetition of a portion of the first; but the first set of outcrops have all a southern dip, and pack in before one another with sufficient regularity (except that some of the bands are much more tilted than others) to induce the supposition that they constitute different members of deposit, though the thickness this would give the whole makes me hesitate to assert such to be the fact. If it were so the sandstones could not be much under 2000 feet in vertical amount. But should there be a flexure and overturn dip connected with the first set of belts, and the second only be taken as a criterion, we should then have just half that quantity. At the mouth of the Chat on the upper side, the sandstones are seen to make a sudden turn southward, running up the lagoon a short way; and it is not improbable that there may be connected with the bend some important fault running up the valley of the river and throwing the sandstones considerably forward on the east side. Rocks resembling them exist in a hill 320 feet high on the east side of the stream about a mile and a half up, the strike of which would bring them out about the mouth of the Ste. Anne River; but probably affected by the disturbance which has been noticed as breaking the conglomerate limestone there, they do not make their appearance before reaching the vicinity of Tourette, where they form the coast to Cape Ste. Anne, continuing on to the Ruisseau Castor, and some distance beyond towards Ruisseau Vallée, which is about twenty-five miles below Cape Chat.

3. If some difficulty existed in uniting these sandstones with the inferior deposits, still more presents itself in combining them with those above. From the mouth of the Ruisseau Vallée across the Rivière Martin, and as far as the Rivière Marsouin, a distance of about six miles, the strata are so disturbed that little information connected with the succession of the deposits can be gained from them. Between the two latter streams black indurated shales chiefly prevail, with a few bands of green and a thin one of red. The cliff exposing them is bold and lofty, but the strata are most violently twisted and broken; the greatest confusion prevails, and it is difficult to follow any individual bed for fifty yards. Numerous cracks result from the disturbances, some of which are filled by carbonate of lime, and others by quartz, and in one or two there is an uncrystalized silicious green mineral, very much resembling epidote in colour. No important beds of sandstone appear in the shales, but some occupy the shore on the lower side of the Marsouin, and stretch nearly to the Albour; but their general character seems to differ from those of Tourette.

The coast from the Albour to the Magdalen, about thirty miles below, exhibits numerous instances of contorted strata, and at the mouths of the chief valleys which terminate in deep bays upon the St. Lawrence, there are displayed several transverse sections in the sides of the mountains, which come close upon the water, and slope up to heights of 800 and 1000 feet. One of these instances is seen on the south side of the Rivière Pierre, (marked Rivière Claude on Bayfield's chart.) where the summit of the hill shows an overturn dip, and the strata in the whole section appear to be arranged in the form of a very flat S. There is one of less importance at Point Corbeau on the upper side of Mont Louis Cove, and a third of a striking character on the mountain east of the Grand Matte River. Farther down the coast, about four miles, in the vicinity of a great bluff called Le Gros Mâle, there are evidences of an overturn dip, and at the mouth of a brook joining the St. Lawrence, in a recess named Marche Bay, a little under two leagues above Cape Magdalen, and about the same distance from Le Gros Mâle, the apex of the flexure connected with it comes out upon the shore. The direction of the anticlinal axis appears to be N. 65° W. magnetic; and proceeding from it upwards along the beach, the strata, presenting at first a north dip of 20° to 40°, gradually become vertical; further on they

overhang ; still further the overturn increases, and the beds becoming flat with the bottom upwards, in this inverted position roll farther over, and for a short distance slope slightly northward. From this, however, they recover after no great interval, but finally in Gros Mâle Bluff they exhibit a short twist occupying about twenty feet in the upper part of the cliff, in which, after returning to an uninverted north dip, they are again canted over to a nearly horizontal position, with the bottom upwards.

The inverted beds examined extend upwards of five miles along the shore, and though the twists on the north side of the anticlinal which roll them over to an upside-down *north* dip are short, and therefore do not produce so important a result, as the simple overturn *south* dip, they serve to illustrate the complication of the strata, and the difficulty of disentangling them in endeavouring to follow out the order of superposition. It is, however, in the rocks thus affected that a third division of the group under consideration makes its appearance. This consists at the bottom, of gray, splintery sandstones, with very large reddish-yellow weathering calcareous nodules or patches (the separation of them from the rock in which they are embedded being occasionally indistinct,) interstratified with gray slates of an arenaceo-argillaceous quality, which are succeeded by black shales with a few graptolites, interstratified at pretty regular intervals with several one foot beds of black limestone, accompanied by a few thin layers of gray calcareous sandstone, the whole surmounted by a collection of gray, coarse-grained sandstones (in which one or two genera of broken bivalve shells and an orthoceras occur,) interstratified with black shales similar in quality to those below.

The thickness to be attached to this division of the group is attended with much uncertainty, but agreeably to the best evidence it has been in my power to collect, the lower part may be estimated at 1100 feet, the middle at 500 feet, and the upper at 400 feet, making 2000 feet together. Below the Gros Mâle, about twelve miles are occupied by the rocks, and the fossiliferous sandstones constituting their summit, are seen on the north side of the anticlinal axis, at the foot of the Bluff, and again on the south side about four miles below the Magdalen river. The sandstones of the base are displayed in the immediate vicinity of the axis on both sides. But the whole band of deposits will probably re-emerge upon the coast to shew a final outcrop on the north

side of the sinclinal flexure, so that it will probably compose several miles above the bluff; but though sandstones and shales are seen nearly the whole way up to the Marsouin River, I am not prepared to point out the precise localities occupied by the different parts.

The useful materials connected with the band are building and flagstones in the upper part, which may be had in abundance four miles below Cape Magdalen, and limestone for burning from the black beds in the middle of the deposit.

4. From the cove where the fossiliferous sandstones plunge beneath the succeeding beds, four miles below Cape Magdalen, to the mouth of the Great Fox River, a distance of about twenty-six miles, the rocks possess a very uniform lithological character. They consist of black bituminous-argillaceous shales, interstratified with thin gray calcareous sandstones, and thin gray, yellowish-weathering limestones. Graptolites are met with in the shales and on some of the limestones, and the surfaces of the more arenaceous layers, when in juxtaposition with the shales, are occasionally very much and very singularly wrinkled, presenting rudely parallel twisted and knotted plications, sometimes leaning a little over one another, with irregular deep and sharp sinuous furrows between. If these were confined to one side of the beds they might become, after ascertaining which it was, a criterion to determine overturn dips. But though they appeared to be generally on the underside, when the strata were considered to be in an uninverted attitude, one instance occurred where there were indications of them on both sides at once.

Many transverse cracks occur in the strata, which when they cross the silicious beds appear to be more frequently filled with carbonate of lime, and when they traverse the calcareous layers often exhibit beautiful transparent, but not very large crystals of quartz, terminating in a pyramid at each extremity of the hexagonal prism, and frequently accompanied by rhomb spar. A multitude of dislocations, usually of small amount, (from a few inches up to twelve feet,) are associated with the cracks; but one is visible near a point a short distance below a brook called the Grande Coupe, four and a half miles lower than the Great Pond River, running across a thicker than usual vertical bed of arenaceous limestone, striking N. 52° W., which throws the masses one hundred and twenty yards northward on the east side.

Undulations in the strata in this part of the coast appear to be as frequent, though perhaps not so important as they are higher up, and instances of them are perceptible wherever points more prominent than the usual run of the shore, or any deep recess, affords a transverse section. Among other places, they may be seen at each of the two points next above Great Pond River; again at the points above and below Little Fox River, and that above Great Fox River; and it is probable that the last three examples, occupying a distance of about six miles, are all on the run of the same flexure, which, in some parts, exhibits an inversion of the beds.

What the thickness of these rocks may be I am not prepared to state; but at the mouth of the Great Pond River there is an exposure of strata, laid bare at the ebb of tide, which measure five hundred yards across, with a S. W. dip, and a very regular slope of 67° to 70° . This alone would give a vertical amount of about 1400 feet. Another exposure of strata, between high and low water-mark, at the mouth of the Great Fox River, measures three hundred yards across the strike, and presents a dip S. 55° W., with an inclination of 65° . This would give a vertical thickness of eight hundred feet. That the latter would pack in before the former as additional strata, if there were no undulations to disturb the calculation, there can be little doubt, but repetitions are so frequently seen that they are a warning against any very positive assertion on the subject. Indeed, it is even very difficult to say whether undetected short sharp folds may not exist to magnify the volume of the separate amounts above given beyond their due proportions; and that such may sometimes produce a very serious error will be apparent, when it is stated that about five hundred yards above Great Cloridon Point, which is about six miles higher than the Great Pond River, six minute corrugations of this description are seen within the space of twenty yards, by three of which the same one foot bed of arenaceous limestone is six times repeated, being thrice bent over to an inverted dip in such a way as to bring the underside of the bed against itself, and to exhibit no difference in the direction, and very little in the inclination of the slope on the opposite sides of the fold. The crowns of the flexures are visible, but had they been truncated by a perfect horizontal section, and the troughs between them concealed, it would have been impossible, by an inspection of the outcrop merely, to have

detected the repetition, and the volume might have been given as six times greater than the truth.

5. Succeeding this division, there is a deposit of very black bituminous shales, with a few beds of black limestone. Graptolites abound in the shales, but they are the only fossils that have been detected. This deposit presents an escarpment at the distance of about six hundred yards across the strike from the strata exposed at the mouth of the Great Fox River; and it can be traced down to L'Ance à Griffon, where a huge black cliff, on the upper side of the cove, affords a good opportunity for its examination. The thickness displayed in connection with the escarpment, is about 1000 feet, the dip being S. 60° W., with an inclination of 54°, while at the end of five hundred yards farther in the direction of the dip, across the continuation of a valley in which the measures are concealed, a set of strata, of much the same character, with a dip in the same direction, but at an inclination of 72° to 74°, exhibits a thickness of four hundred and fifty feet. It is probable that the latter are a part of the former repeated, though there is nothing further to indicate the probability than the greater steepness of the beds.

6. Between L'Ance à Griffon and Cape Rosier, the rocks, which still exhibit many contortions, are black shales, with thin layers of limestone and calcareous sandstone, as far as Ruisseau à la Tierce, where one or two more important beds of grey sandstone are seen not much under fifty feet in thickness, followed further on between L'Ance à la Tierce and L'Ance Louise, with one or two bands of red shale, interstratified with the still prevailing black shales and thin limestones and sandstones, which characterise the whole group.

7. Still to the general apparent dip of the divisions which have been mentioned, is seen, as if superimposed upon them, the series of rocks given in the first or lowest member of the succession of deposits, enumerated as belonging to the eastern portion of the Province, in the Report of Progress for 1843. They properly belong to the group under consideration, exhibiting the same characteristic presence of black shales, with thin interstratified limestones and sandstones, and they occupy the space between the outside of Cape Rosier and the northern base of the mountains, which run out into the promontory, terminating at Cape Gaspé, or Ship Head, as it is commonly called. The distance is not more than three miles, but a turn in the coast at Cape Rosier suddenly taking the line of measurement, in a direction more nearly across the stratification than

anywhere else higher up the river, gives to the band the direct breadth of two miles and a quarter; and if no undulations occurred, the thickness resulting would be very important, as the dip is generally at a very considerable angle. It is difficult, however, to determine the truth. The coast is low and shelving, and the violence of the south eastern storms has heaped upon it a great mass of grey limestone shingle, which covers nearly the whole, with the exception of three points. One of these is Cape Rosier itself, where a breadth of four hundred and fifty yards of the strata, including what are seen between high and low water mark is exposed. They consist of gray limestones, in beds varying from six inches to a foot, with two thicker conglomerate beds, made up of gray limestone pebbles in a calcareous matrix, similar to the conglomerates of Little St. Anne Cape, interstratified with black and gray shales. Contortions affect the beds and a dislocation occurs in them, which disturbs the precision of calculation in ascertaining the thickness, but the general dip would bring it out as not much under nine hundred feet. Separated from the cape strata by an interval of one thousand yards across the measures, which are covered by limestone shingle, there occur at the next point of exhibition gray yellow-weathering limestones interstratified with jet black and gray shales, with a bed of conglomerate or brecciated limestone at the bottom. The distance across the strike is about eight hundred yards; but there are intervals of concealment in it making up three hundred yards of the amount, and though the dip is pretty uniform in direction there are variations in the inclination which ranges from 44° to 60° . Another interval of concealment, which may be about one thousand yards in the direction of the dip of the deposits,—a partial exposure of which at the end of the distance shews a continuation of the same alternation of shales, limestones and sandstones,—brings in a new set of strata, consisting of red, purple, black and olive-green shales, associated with light gray sandstones, sometimes fine in grain and close in texture, and sometimes coarse, with transparent quartz, silvery mica, white feldspar, and very minute bright green specks. A few thin layers of black bituminous limestone are interstratified with the shales. Several violent corrugations are visible in a low cliff in which the beds are exposed, and it is next to impossible to state their thickness, but the measurement across the strike is about three hundred and fifty yards, and the dip varies in inclination from 26° to 90° . Between these beds and the base of the hills which limit the group, there is a dis-

tance of about eight hundred yards across the strike. But the strata are only obscurely seen at intervals at the beginning and end of the measure. The strike appears to be very uniform, being N. 35° W., and S. 35° E.; but only the very extreme edges of the beds are anywhere seen, and the dip is sometimes to one side, and sometimes to the other, at inclinations varying from 50° to 90°. The strata consist, as before, of black shales and thin limestones, which become very arenaceous towards the top, and at the very summit there is a jet black shale, bruising into a jet black powder, which has induced some of the fishermen of the place erroneously to suppose that coal cannot be far removed from it.

If the rocks which have been described as met with in distinct localities between Cape Chat and the neighbourhood of Cape Rosier, were all taken as distinct members of a series, it would give to the group a very great vertical thickness. When viewed in succession in proceeding along the coast, they appear to possess characteristic mineralogical differences, but it must not be forgotten that the distance between the extremes of the line is so great that it would afford ample opportunity for such changes of condition in contemporaneous beds, as might invest them with very different appearances at the different points; and when this is combined with undulations producing such important inversions of the strata as have been alluded to, I am by no means prepared to say that some of the deposits described may not be modified repetitions of one another. The conglomerate limestones of Cape Rosier, for instance, are not unlike those of Little St. Anne Cape, and both are followed by sandstones, associated with red, black, and green shales; and though the interval between the two deposits is greater in one case than in the other, and the sandstones differ in quality, these circumstances are not sufficient to disprove their equivalency when the distance of the localities is considered; and it may be the case that all the members of the group are comprised between Cape Rosier and the northern base of the Cape Gaspé Mountains.

The breadth of this group of deposits on the Chat has already been stated to be eighteen miles, but the only part of the section which requires notice is the six miles on which the chain of Notre Dame Mountains stands. The red shales, associated with the sandstones at the mouth of the river, cease on the stream at the distance of about five miles across the stratification, in a straight line from

Cape Chat, and the remainder of the space to the base of the mountains is occupied by black slates, interstratified with thin layers of limestone and gray sandstone, with occasional thicker beds of the latter, and one of brecciated limestone, which was noticed about two miles and a half to the dip of the red shales. The slates have a cleavage independent of the bedding, and the thin limestones in nearly the whole of the distance possess the peculiarity of a fibrous structure, something similar to that of satin spar, the fibres running at right angles to the plane of the beds.

Although the chain of Notre Dame Mountains runs parallel with the general strike of the strata between them and the St. Lawrence, and the rocks composing them have not been classified separately, I do not recognize them as similar to any mass met with on the coast, notwithstanding the direction they take ought to bring them out obliquely upon it towards the top of the group. Should further investigation prove that they really belong to the group, it will result that their mineral condition must have been greatly changed; but a larger number of facts must be collected to authorize any conclusion respecting them. In all the parts visited they present a metamorphic aspect. Their general colour is pale green, very much resembling the green of epidote. They are hard, close textured and silicious, often presenting the appearance of a very fine-grained sandstone, in which the beds would be nearly obliterated were it not for fine lines of discoloration. Such was their general character on the summits of the highest peaks, and at six localities in our progress up the gorge of the Chat; but loose angular fragments in the stream shewed that the green is sometimes mottled with red jaspers patches, and that some masses display a fibrous or arbestiform structure, breaking into hard long pointed splinters, while others, possessing something the character of mica shist, split into silicious plates, whose separation is facilitated by the existence of flakes of mica, running in parallel layers.

On the summit of the Old Man Mountain, which consists of the close grained quality of green silicious rock first mentioned, we found the needle of our compass deflected 4° . from the ordinary magnetic meridian of the neighbourhood, which is $22^{\circ} 30'$ west of true north. The irregularity may have been occasioned by the vicinity of some vein of the magnetic oxide of iron, but so much of the surface was concealed by moss and trees that our search for it proved unavailing.

2. GASPÉ LIMESTONES AND CALCAREOUS SHALES.

The next group of rocks to be described are those which occupy the promontory of Cape Gaspé. They repose on the previous band, but I have not been able to satisfy myself whether they do so conformably. Their strike is much the same, but their general slope appears to be much less, and they certainly do not present the same contorted condition. At the bottom they consist of gray limestones, in layers of six to eight inches, which are separated by bands of greenish calcareo-argillaceous shale, gradually increasing in amount towards the upper part. The limestone beds are abundantly supplied with fossils—corals, eucrenites, mollusks, crustaceans—and the thickness of the whole is about seventy feet. Among the crustacea *brontes flabellifer* occurs, and *agnotus granulatus*, of the New York Helderberg series, associated with a considerable collection of pentameri of two species, one (the more abundant) resembling *p. galeatus*, and the other *p. oblongus*.

This is followed by an increased development of the greenish shales, which, becoming interstratified with less calcareous layers of several shades of red, give altogether ninety feet; succeeded by one hundred and seventy feet of olive coloured calcareo-argillaceous shales, with occasional large nodules of limestone, and a few layers of the same, some of which are rather arenaceous. The organic remains observed in this part are confined to a few flattened stems of marine plants, replaced by oxide of iron.

Upon these strata rests a set of gray limestones in thin beds, separated by gray limestone shales, of which there are more towards the bottom than the top; and interstratified by three or four bands of the olive coloured shale. The total thickness is not over two hundred feet, and about fifty feet from the bottom there is a seven feet bed, made up of several thin layers of limestone and limestone shale, presenting a singularly wrinkled appearance, from which the beds above and below are free; as if the layers after their deposit had been moved by lateral force into a contorted condition on the stratum giving them support, and then been planed smooth on the top for the deposit of that covering them. But where the inverted arches of the flexures occur, some of the lower layers are occasionally wanting, as if the bed had been ground on the under as well as the upper part. The corrugations are precisely in the direction of the dip, and the peculiarity of the

bed is not confined to a small portion of it; for the same irregularity is observed in it at the Petit Portage, and Cape Bon Ami, which are upwards of a mile asunder, and are the only localities where the limestones with which it is associated have been seen. The fossils of this calcareous band are not so numerous as those of the limestones farther down, but trilobites and a few bivalve shells have been met with.

The next superimposed part of the formation consists of shales, in general gray with a slight tinge of green, and sometimes dark gray. Their quality is calcareous, and they are interstratified with a few bands of arenaceous limestone, which are occasionally sufficiently coarse-grained to approach a fine conglomerate. The total thickness of the deposit is about three hundred and eighty feet. Fossils are not scarce in it, and they consist of marine plants, which are chiefly confined to long flattened slender serpululating stems, and shells, the prevailing genera of which are *lingula*, *orbicula*, *leptena*, *strypa* and *orthoceras*.

To these shales succeed another series of a harder and still more calcareous quality approaching the character of shaly limestones, which are associated, particularly at the top, with good hard but thin beds fit for burning. Among the organic remains of this part, which do not appear to be abundant, are obscure short serpululating fucoids, a *conularia* very like *quadrisulcata*, and a fossil (of which only a small fragment was found) bearing a strong resemblance to Murchison's *pterygotus problematicus*, fig. 4 and 5, pl. 4, Silurian Researches. The thickness of these shales and limestones may be about three hundred feet.

The deposits thus far detailed composing the group under description are altogether twelve hundred feet thick, and they are seen very grandly displayed in the stupendous cliffs which present a vertical naked face nearly seven hundred feet in height on the north-east side of Gaspé promontory. The lowest of the limestone bands constitutes the first step in the rise to the mountains, passing from Cape Rosier to Grand Grève. The second hard calcareous band composes another step on the same path; it forms also Cape Bon Ami, from which the gray calcareous shales present a steep slope up to the foot of the gray shaly limestones; and these rise, in a vertical and even overhanging escarpment, up to the edge of the precipice, from which the harder beds which shield the top of the deposit, slope down into a valley, dividing the hills of the promon-

tory into a double range, and maintaining its character with some constancy further into the interior. From this valley the succeeding members of the group are piled on one another in a second escarpment, and constitute the loftier of the two ridges.

These succeeding deposits are first a set of nodular shaly limestone beds, followed by some of a hard gray quality yielding good material for burning. These are again succeeded by nodular beds, on which rest strata of a more arenaceous quality and of a greenish colour, terminating in a thin layer, which is nearly grass green. These beds are about three hundred feet thick, and a fucoid, much resembling the *fucoïdes caudagalli* of Mr. Vanuxem of the New York Survey, is a common fossil, with a long tailed trilobite.

The remainder of the group is composed of hard gray limestones of a good quality, in beds varying from six to twelve inches, associated in some parts with chert. At the summit fossils abound, consisting of corals, encrinites, mollusks, crustaceans and fucoids. But it is difficult to state with precision the thickness of the deposit, in consequence of a defalcation in the section at the extremity of Cape Gaspé, where the connexion with the lower beds is well exposed, but where the top is lost beneath the waters of Gaspé Bay, near the remains of an isolated rock called the Old Woman, which was swept from its base about two years ago, while numerous transverse faults, of which it is not easy to estimate the value, obstruct the endeavour to bring the position of the uppermost bed up to the line of section, by means of the strike from a locality where it is known. It appears to me, however, that the thickness cannot be far from five hundred feet.

The whole of this calcareous group may thus attain the thickness of two thousand feet. It occupies the whole of the promontory of Cape Gaspé, where it has a dip S. W. with an inclination of 24°; and skirting the north-east bank of the North-west Arm and River of Gaspé Bay, it constitutes a range of mountains, some of whose summits are about fifteen hundred feet high, flanked by a strip of the succeeding formation from Little Gaspé, where the junction of the two is seen. About eight miles above Peninsula Point it crosses the North Fork of the North-west Arm, at four thousand yards across the stratification from the mouth of the tributary, on which a partial section of it, straight across the measures, presents a thickness of eighteen hundred feet, at the bottom of which it is interstratified with layers of hornstone.

On our journey from the St. Lawrence to the Bay Chaleur,

we crossed a calcareous formation, where this was expected; and although the rocks belonging to it were seen only in three places, namely on the Chat, on the ridge of the water shed, and on the Cascapedia, they were sufficient to enable us to conclude that they there occupy a breadth of about eleven miles, from their base on the southern side of the Notre Dame Mountains, where they hold a conspicuous band of nearly white fine-grained sandstone, to their summit, where they terminate against the trap of the Conical Mountain, which belongs to a mass, running with the strike of the strata on both sides of it, (being interposed between the limestones on the northward and the succeeding formation on the southward,) and bearing for another conical peak called by us the Barn-shaped Mountain, the place of which was determined by triangulation to be eleven miles distant in a direction N. E. and the quality of which, from its form it appears to me probable, will prove to be trap also. The breadth assumed by the limestone in this section may lead to the inference that the general dip of the strata can be but small. They were too much covered up, however, to afford any satisfactory evidence. On the Chat the inclination of the beds was in some parts 16° to 25° , and in others it did not exceed 1° to 2° . In the vicinity of the trap of the Conical Hill it was not less than 40° . But on the ridge of the water shed it was under 5° . Fossils were abundant in the lower part. They were found in many loose angular fragments exposed in water courses, or beneath the roots of overblown trees all the way across, and they were obtained in the highest part of the formation on the Cascapedia. But it gives me regret to state that the collections we made and with much trouble transported across the country, were subsequently wrecked on the coast of Labrador, on their passage from the Bay Chaleur to Quebec.

The formation was again crossed on the Matapedia River and Lake, and its base, associated there as on the Chat with a band of white sandstone, forms the south-west side of the larger lake from one extremity to the other, dipping in a direction S. W. at an angle in general under 10° ; but the breadth it may possess I am not prepared to state.

In the five miles of this formation which constitute Gaspé Promontory, there are two localities in which the sulphuret of lead is met with. One of them occurs in the bight of Little Gaspé Cove. The limestone, denuded of the overlying arenaceous deposit, is there washed clean by the waters of the bay, and exhibits several small

cracks filled with the mineral, associated with calcareous spar. The course of two of them is S. 27° E. and they underlie to the northward. At the thickest part the veins are each about one inch wide, but they thin out both ways in a few yards. Near these cracks there exists a fault or dislocation producing a downthrow on the westward side, and by it the limestone is brought against the sandstone of the succeeding deposit. It is probable the cracks charged with the ore have some relation to this dislocation; but the soil and herbage covering up the fault disabled us from ascertaining the nature of the material with which it may be filled. The other locality of galena is in Indian Cove, close by the fishing stage of Messrs Pierre and Antoine Simon. A dislocation is plainly discernible at this place: it is a downthrow to the south-eastward of at least thirty fathoms, by which the sandstone of the superior deposit is brought opposite the limestone; and between the calcareous and silicious walls thus situated, there exists a lode of about twelve yards wide where I measured it, composed of the ruins of the two rocks cemented together by calcareous spar. In this there are many small veins of calcareous spar, which appear to be the seat of the galena in cubic crystals. The principal of these subsidiary veins is about two inches wide in the thickest part. It has an underlie or slope N. 50° W. at an inclination of 55°. But the general course of the whole lode in which the small veins occur is about N. 42° E. and the underlie seems to be to the S. W. side. The quantity of rubbish obscuring the face of the cliff rendered it impossible, without delay and expense, to ascertain the quantity of lead ore that might be obtained from a fathom forward of the lode; but without giving any opinion on this point, I may say it is not improbable the lode may hold its course for some distance, as the fault points to a transverse valley or depression in the hills behind, which appears to run across to the opposite side of the promontory. But in a dislocation on the north side which was considered to correspond with it, none of the ore was observed. According to the analysis of my assistant, Mr. De Rotterdam, the ore contains more antimony than lead, though the crystallization is that of galena.

Transverse dislocations are of common occurrence in the vicinity. One of them is seen in a recess about a quarter of a mile above Indian Cove, filled with white calcareous spar, which is nine feet thick in one part and one foot in another. The underlie of the vein is S. 41° E. < 76°. The dip of the strata at the spot is S. 79° W. < 25°

On the north side of the promontory seven dislocations may be taken in at one view, in the space of about a mile and a half in the face of the cliff, from a boat placed at a convenient distance in front of it. The displacements in six of them compensate one another, and the slope or underlie of the fault in every instance points in the direction of the downthrow. In connection with the subject of faults it may be mentioned that a trap dyke cutting the strata, without any apparent displacement of them, is seen a little to the north of the Petit Portage in Cape Rosier Bay. Its breadth is eight feet, and it cuts a part of the shale which occupies a position between the two lower bands of limestone. The rock on each side is a little harder than elsewhere, but it is not otherwise altered. The course of the dyke, which is very nearly vertical, is N. 55° W.

3. GASPÉ SANDSTONES.

Succeeding the calcareous series of deposits which have been described, the next in the order of superposition is an important arenaceous group, which, judging from the thickness it displays on Gaspé Bay, will probably present a conspicuous figure in the map of the Eastern Geological Division of Canada. In the accompanying Appendix a detailed vertical section is given of the strata, taken from the locality of their greatest observed development, by which it would appear they do not fall short of seven thousand feet. This section does not reach the base of the group, but its termination is probably not far removed from it. The lowest portion of the series consists of gray argillaceous and arenaceous shales, with beds of gray sandstone, only one of which is of much thickness, (75 feet,) holding spherical masses harder than the general quality of the bed. Towards the bottom the beds weather of a rusty brown colour, and contain abundance of fucoid like plants, one of which bears a strong resemblance to the graphic fucoid of Mr. Vanuxem. Many of the surfaces are sprinkled with carbonized comminuted remains of plants, and there is towards the lower part a small seam of coal and carbonaceous shale, together measuring three inches, which appears to hold a regular course, with a bed of clay beneath it, but in too soft a condition to enable it to be determined whether it contains any vegetable remains. This deposit is about five hundred feet thick.

It is followed by a series of drab sandstones, many of them incli-

ning to a reddish tinge with spherical masses harder than the general quality, and exhibiting strong and extensive ferruginous stains. A few scattered pebbles exist in some of the beds, and the whole, in general thick, are separated from one another by layers and partings of gray argillaceous and arenaceous shale. Nodules of argillaceous iron ore are contained in some of the beds, and carbonized comminuted plants are frequently displayed on the divisional surfaces. The thickness of these beds is about nine hundred feet.

They are succeeded by another set of drab sandstones inclining to a reddish tinge at the bottom and to green at the top, with occasional scattered pebbles and large spheres harder than the general quality of the enclosing rock. Ferruginous stains are frequent, and the beds are separated by gray argillo-arenaceous shale layers, which, as well as the sandstones, sometimes contain argillaceous iron ore. In the middle and lower parts are interstratified two conspicuous beds of deep red or claret coloured, green and dark gray argillo-arenaceous shale, in the upper one of which there are two and in the lower eight bands of gray, hard, tough rock, much like fire clay, penetrated vertically by slender root-like impressions, which occasionally bifusate downwards. The thickness of this part is about four hundred feet.

Next follow a great series of drab sandstones inclining to green, of which some beds contain pebbles, and many parts have large spherical masses, harder than the general quality. The beds are in general very thick, and they are separated by layers of gray argillaceous shale, from which occasional large and abrupt argillaceous lumps protrude into the superincumbent sandstone. Carbonized comminuted remains of plants occur on the surfaces of the beds in the lower part. These sandstones present a thickness of two thousand feet.

Succeeding them there is another series of drab sandstones, (in only a few of which there are pebbles,) interstratified with five conspicuous deep or claret red, green, and gray argillo-arenaceous shale bands, of the aggregate thickness of one hundred and forty, and giving with the sandstones, about four hundred feet.

Upon these rests a set of drab coloured, strong and coarse conglomerate beds, some of one hundred and fifty feet thick, in which the pebbles consist of various coloured quartz, porphyry, blood-red and other coloured jaspers, and among them limestone is occasional, feldspar not unfrequent, and a conglomerate stone rare. The pebbles

are enclosed in a matrix of greenish gray or drab coloured sandstone, and in a large portion of the deposit, they diminish in quantity, leaving a predominance of the arenaceous constituent of the rock, which is then a strong pebbly drab sandstone of a moderately fine grit, with carbonized remains of comminuted plants on the surfaces of the beds and in their elementary layers. The thickness of these beds is about eight hundred feet; and the whole of the mass, in which drab-coloured sandstones so greatly predominate up to this point, is about five thousand feet.

To these succeeds a series of red sandstones, with green stripes and spots associated with occasional drab beds and infrequent conglomerate layers; but all interstratified with green spotted and striped red argillaceous and arenaceous shales. In many cases the sandstones exhibit on the under surfaces highly relieved casts of shrinkage cracks, and on the upper surfaces ripple-mark; and the shales are sometimes penetrated by branching plants in vertical, oblique and prostrate attitudes, while one or two beds occur with root-like fibrous impressions, running at right angles across them. This red deposit is about eleven hundred feet thick.

It is followed by a series of drab sandstones, which in the lower part are clouded or mottled with a reddish tinge, and at the bottom exhibit an interstratification with red shale; but at the summit are inclined to gray. In many parts they hold scattered pebbles consisting of white and greenish quartz and blood-red jasper with some of limestone; but the pebbles do not in any bed become so numerous as to constitute a conglomerate. On the surfaces of many of the beds, and in their elementary layers, which are occasionally oblique, there exist carbonized broken vegetable remains. The thickness is about six hundred feet.

The base of this great collection of arenaceous deposits is to be met with in Little Gaspé Cove, and the inferior portion of it skirts the north-eastward side of Gaspé Bay and the North-west Arm, from that spot as far as the North Fork, which is as far as it has been continuously traced in that direction. It there occupies a breadth of about three thousand yards in a straight line across the measures, giving at the average dip it presents a thickness of four thousand feet. On the south-west side of Gaspé Bay, in the neighbourhood of Gaspé Basin, the same measures rise with an opposite and more precipitous slope, forming a trough under the bay. The thickness there exposed is again about four thousand feet. The same

beds then fold over an anticlinal axis, which comes out upon the Bay near Cape Haldiman, and dipping at a very moderate angle on the south side of the axis, beneath the lagoon at the mouth of the River St. John, they re-appear with a nearly opposite dip at the south-eastern end of Douglastown Village, and exactly face the Great Cape Oiseau, (Cape Brulé of Bayfield's chart,) and Little Gaspé side of the bay. Following the coast they exhibit a slight sinuosity in Seal Cove, (Bréhaut Bay, as marked in Bayfield,) and at the extremity of the point between this cove and the next one farther down, they fold over another anticlinal axis, the position of which is indicated by a trap dyke of a very marked character. It is from this point to the termination of the series in the cove immediately above Pointe Jaune, or Yellow Head, that the measures given in the vertical section are found. The coast cuts them obliquely, but at every step new strata are added in an ascending order of super-position, until Long Cove is reached, where the red sandstones are seen.

In this cove the measures have a very moderate inclination, and a slight protrusion in the line of strike causes the coast section of the cliff to present a gentle arch in the centre, repeating a part of the beds. But further on the section still gains upon the strata in the vicinity of Redhead, and beyond it, until they are suddenly cut off by a fault at the spot already indicated as the termination of the series. In the whole distance the strata are seldom concealed, and though several small faults occur, the allowance to be made for them is seen in the cliff, which is in general bold.

The two flexures which have been noticed appear to run parallel to one another, to the mountain ranges of the neighbourhood, and to the general strike of the calcareous rocks on the north-east side of Gaspé Bay. They may be about three miles asunder in a direct line. The northern one is traceable for seven miles from the vicinity of Haldiman Bluff to the inner basin at Gaspé, which it crosses not far from the Episcopal Chapel, in a line that would strike the rear of Mr. Becharvaise's lot, near whose house its effect has brought to the surface some sandstone strata well stored with fossils, deriving from their presence a calcareous character. The criterion which has been taken as indicating the direction of the southern one is the course of the trap dyke in its vicinity, which, however, has been traced only a short distance, as it soon becomes covered up after striking into the forest. The dips on the north-east sides of both these flexures are more precipitous than those on the south-west. But the strikes

of the anticlinal beds are not precisely parallel. They converge south-eastwardly, from which it would result that the ridges or crowns of the folds would slope in that direction.

Trap dykes were observed cutting through the rocks of this formation in five separate localities. One of them exists about a mile and a quarter above the outside point of Little Gaspé Cove. It is about four yards wide, and its course, as far as displayed on the shore, is S. 65° E. There is, however, a turn in the dyke running for five yards in the direction of S. 55° W. and coinciding with this turn, there is a cross fault, of which the underlie is S. 35° E. < 68°. It is about six to eight inches wide, and it is filled with compact feldspar holding opaque white crystals of feldspar and irregular veins of carbonate of lime. In that part of the main dyke which is near, thin veins of iron pyrites occur, which have an irregular parallelism with the cross fault. The main dyke is composed of greenstone. It is about perpendicular, and the strata, which have been indurated on each side, dip S. 73° W. < 28°.

The second dyke occurs about 300 yards below Little Cape Oiseau (Cape James of Bayfield.) Its course is about S. 70° E. and its underlie, which is to the southward, is 88°. There is an angular turn in it which carries it N. 30° W. for a few yards. Its mineral quality is much the same as that of the former, and it exhibits a tendency to a transverse columnar structure.

The third stands up like a wall at the mouth of a small brook about three hundred yards above Little Cape Oiseau. Its course is S. 87° E.

The fourth occurs on the opposite side of the Bay, in L'Ance Cousin, close by the mill and brook, about a mile and three quarters above the Bluff on the upper side of the entrance to the south-west Arm. Its course is S. 85° W. and its underlie is to the southward 78°. Its breadth is five yards. It is composed of greenstone, and two feet of it on the north side, appearing to possess more hornblende, and weathering of a more rusty colour than the rest, exhibit an imperfect transverse columnar structure. The sandstone on each side of the dyke dipping N. 65° E. < 56° is hardened for a short distance, and displays a more than usual number of joints parallel to the dyke.

The fifth trap dyke is that connected with the southern fold in the strata. It is not situated in the centre of the fold, but about two hundred yards on the north-east or precipitous side of it. Its

course is S. 70° E., and it is very nearly vertical. Its breadth is ten to twelve yards. Its colour is dark gray, weathering to a rusty red, and it is a greenstone with probably a large proportion of hornblende. It presents many horizontal and vertical joints or divisions, and these are frequently filled with thin veins or plates of bluish white calcedony. The same mineral lines a multitude of large and small druses, giving botryoidal surfaces and having again in the interior transparent quartz, and occasionally dogtooth and other crystals of calcareous spar. In these druses, and in others, not lined with calcedony, there occurs a black bituminous liquid, which has all the characters of petroleum, but in some of the cavities is hardened into a resinous pitch-like condition. In some parts of the dyke the petroleum druses are so numerous that there is scarcely a fragment the size of the hand that does not contain several of them, and the tar-like smell of the mineral is perceived in walking by the dyke at the distance of fifty yards. Towards the southwest side the dyke is partially amygdaloidal.

In the neighbourhood of Gaspé Bay, four mineral springs exist in the rocks of the formation under description. Two of them are bituminous, and two of them are sulphurous. One of the bituminous springs is situated on the south side of the St. John River, about a mile and a half above Douglstown. The liquid is petroleum, and it oozes from the mud and shingle of the beach. On digging small pits a black earthy deposit two or three inches thick is perceived lying on bluish gray clay, and it is from this black earthy deposit that the liquid was seen to exude, and none of it from the clay; though there can be no doubt there must be some orifice in the clay to allow the communication with the deposit resting on it. The liquid collects in the pits in a thin film on the surface of the water entering with it; and from twelve pits, I with difficulty obtained half a pint in four hours. When the beach is covered with water, intermittent black blotches are seen to rise through it in several spots, which, floating on the surface, are carried by the wind or the tide to the first impediment offered by any stick or collection of seaweed rising above its level, and occasionally a small supply of it is found thus embayed. Localities yielding the liquid are said to exist at intervals all the way up to the lower extremity of the first marsh island, a distance of about three-quarters of a mile, but though I examined about half of it, I did not detect any of them.

The position of the other petroleum spring is about two hundred

yards up a small fork of the Silver Brook, which is a tributary of the South-west Arm, falling into it about six or seven miles above Gaspé Basin. The exact orifice from which the bituminous liquid issues is not easily determined; but it collects on the surface of the water, wherever impediments cause a quiet pool, in the form of a thick green scum, which can be taken up with a spoon. A copious spring of pure water rises up at the spot, and though none of the petroleum was visible on the surface of the spring at its issue, it is not improbable some connexion may exist between their sources, as no trace of it was found higher up the brook. About a pint of the bituminous liquid was collected in half an hour, but this was from an accumulation found covering a small pool, on reaching the place, the odour of which could be perceived for one hundred yards around.

These two bituminous springs, and the position of the bituminous trap dyke, where seen upon Gaspé Bay, are very nearly in a straight line in relation to one another, the extremes of which would be twenty miles asunder; and the bearing of the line is as near as may be in the direction assumed by the dyke as far as it could be traced. It appears to me not improbable, therefore, that the springs may have some connexion with it. It is to be remarked, however, that the liquid in the druses of the trap is jet black, whereas that of the springs is of a decided but very dark green. It was always found mixed up with a considerable quantity of the leaves of the spruce and balsam fir trees, which exist in the vicinity of both localities, and these may have had some effect on the colour.

The two sulphurous springs are situated more in the immediate vicinity of Gaspé Basin. One of them, the position of which was obligingly pointed out to me by Mr. Becharvaise, is found within twenty yards of the upper dividing line of Mr. B. Patterson's lot, at about one thousand yards back from the road along the South-west Arm. Its distance from the Basin is about two miles. The locality of the other is on the right bank of a small brook about three quarters of a mile from its junction with the North-west Arm just above Point Naveau, four miles and a half from the Basin. It is a short distance removed from the brook, and issues from its source one hundred feet above the brook's level. The water of both these springs has much the same mineral qualities. The specimens sent up to Montreal for analysis have unfortunately never reached their destination; but determined by such tests as could be used on the spot, by Mr. De Rotterdam, who accompanied us on our exploration for part of

the time, it appears that, in addition to sulphuretted hydrogen gas, —a considerable quantity of which bubbles up, and escapes at the sources,—the waters contain in solution, soda, magnesia, and lime, in the form of muriates and sulphates.

Reference has already been made in the section which has been given of the strata of this group of rocks, to the existence of a small but regular seam of coal found towards the base of the series. It is not, however, to be inferred from this, that the group belongs to what is emphatically called the carboniferous era, or that there is much probability of discovering the mineral associated in sufficient quantity with its strata, to render it profitable to mining enterprise. Though seven thousand feet of vertical thickness, with very little defalcation, have been carefully examined in continuous succession, nothing like a workable seam, nor anything but this one like a regular seam, or like a seam at all, has been met with; and while some of the fossil plants and the lithological character of the whole series appear much to resemble what in the New York succession is termed the Chemung and Portage Groups, with perhaps the addition of what the geologists of that State term their old red sandstone, (though I have no distinguishing mark by means of which to establish a division in Gaspé), there is still to be described a set of rocks, which, in Gaspé as in New York, overlie these, and belong to the carboniferous series, though the part resting in Canada appears to be too low down to be associated with the profitable seams of coal.

Another mineral, the presence of which may give to these rocks the semblance of coal measures, is argillaceous iron ore. By a reference to the sections on the south side of Gaspé Bay, given in the Appendix, it will be observed that it is there largely disseminated in nodules both in the shales and sandstones. Specimens analysed by Mr. De Rotterdam yielded twenty-six per cent of pure iron, associated with alumina silice and lime. But though there is much of the ore, it was not in any observed locality so regularly placed as to render it available to mining enterprise, worked by a level; and the rocks in which it most occurs, are too hard to be attacked by the system of *patching*, as it is termed in Wales, by which is meant the separation of the ore from the bed containing it, by means of a strong and well supplied current of water directed upon it.

On the Cascapedia these rocks appear to occupy a breadth of several miles on the south side of the Conical Mountain; which interposes a trap band of a mile broad between them and the calcareous

group below. The lower part leans against the trap, exhibiting a dip of about 50° , for about a mile, as determined by the strata at the two extremes of the distance, while the red sandstones fill a space of about two miles and a half at an angle varying from 7° . to 10° . on that south flowing part of the Cascapedia passed on first taking to our spruce bark canoes. The eastward flowing portion of the stream occupies a valley in the strike of the red sandstones, and turning southward the Berry Hill displays gray sandstones corresponding with those overlying the red rocks on Gaspé Bay.

On the Matepédia the relations of the group are more obscure, and the facts which may bear upon them have not been sufficiently arranged to be available on the present occasion.

4. LIMESTONE CONGLOMERATES AND RED SANDSTONES.

The next series of rocks to be considered occupy a position on Gaspé Bay, extending from a small cove immediately on the upper side of Pointe Jaune, which is the next small cape above White Head, as marked on Bayfield's chart, to the extremity of Point Peter. A vertical section, with the details of the measures there displayed, is given in the accompanying Appendix, by which it will be perceived the strata consist of a set of strong coarse calcareous conglomerate beds, interstratified with red sandstones. The chief composing pebbles of the conglomerates are of gray limestone and calcareous sandstone, many of which would weigh seven to fifteen pounds, while some contain organic remains recognised to belong to the upper part of the Gaspé limestone formation. In addition to the calcareous pebbles, the beds hold many silicious ones, which are in general of igneous origin, and among them blood-red jasper strikes the eye, and from its brilliancy of colour attracts attention. It is the jaspers and occasional agates of these conglomerates, and also of the silicious conglomerates in the subjacent group, (from which probably the upper rock has received its supply,) that constitute the Gaspé pebbles, which have some celebrity among Canadian collectors; and they may be seen in great abundance in almost all the coves along the shore, where they have been washed up during storms, after having been weathered out of the rock. The matrix of the calcareous conglomerate is generally a red sandstone, the colour of which, in combination with the light gray of the limestone and other pebbles, gives to the mass a creamy, pinkish

hue; but it is probably owing to a pervading mixture of calcareous material, which, where the sand is thin, is occasionally displayed in patches filling up the interstices among the pebbles, in the form of white calcareous spar, that the strength of the rock is attributable.

The thickness developed in this section is 2700 feet, but it is very probable this shows by no means the total amount of the deposit, and even in the locality from which the data are derived, there is presumptive evidence that something might be added. The highest part of the section is at the very extremity of Point Peter, where a succession of strong conglomerate beds plunge beneath a rock called Flat Island, lying exactly half a mile out in front of it, and having a dip identical in direction, though less in inclination. The direction of both is S. 59° E. and the Point Peter beds slope at an angle of not less than 15° . Supposing there be no fault or undulation in the intermediate channel, if the angle of the half-mile be assumed at 7° . or 8° . it would give about three hundred feet more to be added to the vertical thickness, making the formation at this place three thousand feet; and as in the cove above Pointe Jaune there is some evidence that the formation is let down into its position by a dislocation, the value of which is unknown, it is not improbable there may be something to add to the base as well as the summit. The course of the fault in question seems to be S. W. and N. E. and the older strata, which five hundred yards from it across the measures have a dip not exceeding 10° , and at half that distance not exceeding 20° , are gradually tilted up to 40° and even 60° as they come up to it, while the newer ones slightly bent or brushed up at their extremities just at the junction with the former, abut against the face of them, and present a moderate slope (12° to 18°) maintained with considerable uniformity to the extremity of Point Peter.

In this vicinity all the way from Pointe Jaune to Tickel inlet, the salient parts of the shore are composed of conglomerate, the re-entering of fine grained sandstone, which being softer than the other more easily yields to the wearing effects of marine and atmospheric influences, and explains the zig-zag structure of the line of coast, the general course of which, on both sides of Point Peter, is oblique to the stratification. At Malbaie Village one of the beds interstratified with the conglomerates is wholly calcareous, and constitutes a limestone which has been used for burning.

COAST SECTION OF THE BAY CHALEUR.

The rocks of the formation which has been last described are seen on many parts of the coast proceeding from Point Peter round into Bay Chaleur, as far as the Restigouche River, a distance exceeding one hundred and twenty miles; and while they present a few modifications in their lithological character, they give complete evidence of their want of conformity with the deposits on which they rest.

From Tickel inlet to Beach Corner, near Mr. Mabey's ship yard, they are covered up for about five miles by the barrier of sand and gravel, separating the lagoon at the mouth of Malbaie River from Mal Bay itself. But one hundred and seventy yards beyond Mabey's Brook, they again make their appearance, not however with the moderate southern dip of the inlet, but bent up to a high angle, with a northern dip, and occasionally presenting a perpendicular face. One of the conglomerate beds shields the cliff, but pursuing the strike it is seen broken through at intervals by transverse landslips, and the red shales and fine-grained sandstones, with which it is associated, become exposed through the loop-holes, which have thus been dashed out, while the intersection of one or two brooks give deeper cuts and exhibit other conglomerate layers. This forms the character of the cliff for a mile to Coin des Roches, and beyond it, but at a gap called the Petite Coupe, or the Little Blow Hole, a limestone belonging to a lower formation makes its appearance. This, however, becomes again covered up, farther on, by conglomerate beds (one of them holding large angular fragments of yellow limestone in a strong calcareous cement) which now present a curved face diminishing in slope at the top; and by these the lower rocks are masked until approaching the Great Blow Hole, where they once more break through their covering and run out, in vertical or highly inclined strata, into Barry Cape, the extremity of a sharp narrow ridge of rocks between Barry Brook and Mal Bay, the highest point of which, called the Peak, (six hundred and sixty-six feet above the water,) is crowned with the conglomerate in a horizontal attitude, staked upon the points of the uncomformable beds beneath.

The perforated or split rock from which Percé takes its name, is an isolated, almost inaccessible mass of the older strata, which, standing up like a wall, in continuation of the limestone of Barry Cape, overhang the perpendicular 10° north-eastwardly, with a length of five hun-

dred yards, a breadth of one hundred yards, and a height of two hundred and ninety-nine feet (agreeably to Mr. Moriarty, who has measured it with a plummet,) and present two arches which have been pierced through them by the action of the waves. Mont Jolli and Battery Point are parallel strata of the same formation, underlying the perforated rock geologically, and it is plain from their strike that they run under the Percé Mountains, the whole of the summits of which are composed of the flat conglomerate. The flat top of the Split Rock, and of that part of the Barry Cape rocks called Les Murailles, extending to the cone of that portion of them termed the Peak, are probably remains of the ancient surface, on a continuation of which the conglomerate is based; and the height of this surface being about three hundred feet above sea level, and that of the most elevated summit of the Percé Mountains, twelve hundred and thirty feet (according to Bayfield's chart,) it would appear that a vertical thickness of conglomerate, not falling short of nine hundred feet, is present in these mountains. Lofty perpendicular precipices of it are seen on several sides of the Table Roulante and of Mount Ste. Ann; and its base may be traced along the Percé flank of the latter, descending as it proceeds southward; though where it probably reaches the shore in the neighbourhood of Messrs. C. Robin & Co's buildings, it is concealed from view by the gravel of the beach. But Percé Reef, which is composed of the rock, marks the direction of its probable submarine connexion with Bonaventure Island, wholly formed of it, where its massive beds rise up at a moderate inclination to the northeast side, constituting vertical cliffs six hundred feet in height, giving unapproachable shelter to myriads of gannets, cormorants, gulls, and other sea fowl.

Proceeding southward from Messrs. C. Robin & Co's establishment along the main shore, the base of the deposit again makes its appearance near La Festie's Brook, whence it gradually rises up at an angle increasing from 2° to 7° , once more to unveil lower unconformable strata in White Head, which is composed of limestones of excellent quality for burning, tilted up to 70° ; and the two formations are seen in juxtaposition for between five and six hundred yards, the lowest member of the upper rocks being a ten feet whitish gray, hard calcareous bed, greenish at the bottom, with many small transverse veins of red and white chert.

In the White Head limestones there are a few fossils; the limestones of the split rock and Barry Cape abound with them, and it is not

improbable that these may be of the same epoch as the Gaspé calcareous group.

The Barry Cape limestones are associated at the base of the Peak with a band of white sandstone which would afford a beautiful material for building purposes; and in one of the numerous veins of calcareous spar with which these mural precipices are vertically laced, there are traces of lead ore, having a large proportion of antimony associated with it.

Continuing to trace out the geographical distribution of the upper rocks round the coast, a dislocation occurring about five hundred yards westward of White Head, lets down their terminal edges against the face of the White Head limestones, which are seen in transverse section, with a dip S. 20° W. $< 58^{\circ}$ shewing the direction of the fault to be N. 20° W. The upper rocks, consisting here chiefly of red saunstone, with only a very few conglomerate layers, slope in towards the limestones, maintaining an eastern dip bringing up lower measures for about a mile, beginning with an inclination of 20° , but diminishing to 4° , and then becoming horizontal on the crown of a flat arch, which causes a repetition of some of the beds in ascending order farther on, and brings the general strike of the measures to coincide pretty much with the coast as far as Beaufile Bay, with a gentle slope to the eastward of south. The red sandstones between the White Head fault and Beaufile's Bay, have an exposure for three miles and seven furlongs, and the cliffs they form, varying from twenty to one hundred feet in height, display no less than twenty-four minor dislocations, the values of nearly the whole of which are at once visible. The following is a list of them exhibiting their courses and underlies, as far as it could be determined by the evidences on the beach and in the cliff, with the amount of upthrow or downthrow, proceeding westwardly along the coast, the compass bearings being given in degrees numbering eastwardly from north as zero.

No.	Course. Bearing.	Underlie. Bearing	Inclination.	Downthrow. Feet.	Upthrow. Feet.
1	5°	275°	80°	7	
2	340°	250°	58°	90	
3	320°	40°	65°	6	
4	315°	225°	68°	6	
5	310°	220°	61°	8	
6	325°	235°	56°	1	
7	325°	235°	65°	2	
8	320°	50°	75°		1
9	325°	235°	65°	7	
10	325°	235°	65°	4	
11	335°	245°	65°	2	
12	330°	240°	65°	1	
13	325°	235°	65°	8	
14	325°	235°	65°	+ 100	
15	350°		90°	1	
16	310°	40°	83°	30	
17	?	?	?		30
18	325°	235°	75°	12	
19	235°	55°	80°	30	
20	325°	235°	75°		+50
21	325°	235°	60°	30	
22	345°	225°	70°	5	
23	310°	40°	75°	10	
24	310°	40°	65°	5	

After an interval of six furlongs covered over by the sandy beach of Beaufile or Upper Cape Cove fishing village, another mile and a half of red sandstone cliff occurs, presenting another flat arch, shewing a general sweep in the strike keeping it with the trend of the coast, which has here more of southing in it; and eleven dislocations of a similiar character with the foregoing occur. Another interval of sandy beach, occupied by Lower Cape Cove village, brings us to Cape d'Espoir, where one hundred and ten feet, composed chiefly of conglomerate beds, with a dip S. 10° W. < 4°, are presented in a vertical cliff, and these continue on the strike nearly three miles to Little River, where lower unconformable rocks once more break through.

These consist of hard arenaceous limestone beds, of one to ten inches thick, separated by layers of fine bluish gray argillaceous and slightly calcareous shale, dipping nearly north, at an angle of 73°, which, after

peeping out at intervals for half a mile, at the base of the conglomerates, and in contact with them, again become shut up for about three-quarters of a mile, in which the conglomerates alone occupy the cliff. A trap floor then becomes intercalated with these beds at the spot called *Les Roches Noires*. Its thickness is ten to fifteen feet, and occupying the upper part of the precipice, which varies from one hundred to sixty feet in height, it maintains a constant position for about a mile, in the latter part of which the lower rocks in a contorted attitude, again are seen giving the others support. All are visible at once in the cliff section, which is composed of ten feet of conglomerate at the top, then ten feet of trap, followed by thirty feet of conglomerate, based upon ten feet of the contorted calcareous strata. In the interval between this and the Grand River the cliff is disputed between the horizontal conglomerate and the tilted strata beneath it, each occupying about half the height, and where any brook empties itself into the bay, the conglomerate is wholly removed. Approaching Grand River, after a distance occupied by the conglomerate in a low cliff, there is a space covered with sand and gravel, but denuded of this another mass of trap—perhaps a continuation of the previous layer—paves the beach at the extremity of Green Point, near Messrs C. Robin & Co.'s premises, and coming from below it the conglomerate crops out to form a narrow strip of flat surface on the east side of the river's mouth.

It is probable that in the whole distance from Little River, the conglomerate beds, which have a gentle dip south, possess very little breadth, being nothing more than patches of the rim of the formation, saved from the wearing marine action which has carried off other parts, by the presence of the harder tilted strata at high water mark; for it is perceptible that wherever the flat conglomerate wholly occupies the cliff, the waves dashing against its base wear deep horizontal caverns beneath; and deprived of support, great masses cracked vertically off, fall in huge fragments, forming a temporary talus, of which it is possible the ice of winter may assist other causes in effecting a removal. With the exception of the narrow strip at the mouth of the stream, none of the conglomerate is seen on the Grand River for six miles up; the banks being composed of dark gray slate, with a cleavage independent of the bedding, associated with dark gray limestone beds and occasional arenaceous layers. The coast line to the westward, however, with the exception of those parts covered by sand, and particularly of the barrier to the lagoon of

Little Pabos is wholly occupied by the newer rock displayed in cliffs varying from ten to forty and not exceeding sixty feet, and belonging to a continuous but narrow belt of the deposit, until reaching a brook about a mile and a quarter eastward of Grand Pabos sand beach, four hundred yards beyond which brook it terminates ; and between this termination and the neck of Grand Pabos beach there is only one small thin patch at the *Pointe du Portage*, extending about half a mile which is seen resting on the lower rocks now changed in their character from calcareous to arenaceous.

From the neck of Grand Pabos lagoon none of the upper deposit (with the exception of a small patch at a point called *Jardin à Naveau*) is seen until attaining the south side of *Point Macquereau*. The interval is thirteen miles along the coast, and it is occupied by a great mass of sandstones most of which are of a gray, or grayish green colour, while some parts, towards the Pabos side, possess a light red tinge or a rusty brown. The sandstone has often a glazed or vitreous aspect, and many of the beds are fine, but never coarse conglomerates, with white and transparent quartz pebbles of the size of No. 4 to No. 6 shot. The whole mass is more or less associated with bands of shale or slate, often with glossy or saponaceous surfaces in the direction of the beds, sometimes approaching a micaceous and sometimes a talcose quality, and the colours are various shades of gray, to occasional deep black. Approaching *Cape Macquereau* the predominating proportion of sandstones increases, and the crystalline condition of the rock gradually increases also, until in the immediate vicinity of the Cape it assumes quite a metamorphic character. Crystallised feldspar runs through it in reddish sheets in the direction of the beds, and layers of white quartz occasionally run with it, while other layers of a slaty character split into glossy laminae, and a considerable portion of the rock is of a bottle green colour with much the appearance of an imperfect greenstone. The mineral quality and general condition of these rocks more resemble those of the mountains of *Notre Dame* than any others that have come under my inspection, and they occupy a belt of much the same breadth, being about seven miles in a straight line across the strike. The stratification is in general well indicated in the whole breadth of the formation. The parallelism of the lines of strike on the coast is remarkable, and the courses of the streams coming from the interior as given on *Mr. M'Donald's* survey of the Township of *Newport*, shows that it is maintained for some distance. The direc-

tion is with little variation not many degrees to the north of west, but the dip, which varies in inclination from 45° to 90° , is sometimes on one side of the line and sometimes on the other. In a large portion of the breadth, however, it seldom varies 10° to 20° from the perpendicular. That there are undulations in the strata is very probable; but if they exist they are of so sharp a form, and so much of the rock is of a uniform character, that it is very difficult to determine their position notwithstanding there are very few intervals of concealment in the whole distance.

The metamorphic strata of Cape Macquereau are as near as possible vertical and in that attitude they run along the shore, which is much on the strike from the extremity of the point, towards L'Ance à la Veille, where they are seen unconformably in juxtaposition with an overlying calcareous deposit, which again unconformably supports the conglomerates we have been tracing along the coast. The proofs of this double discordance lie within the space of half a mile. The spot is just under two miles westward of the county line between Gaspé and Bonaventure, and there is no concealment of the strata, from one point to the other to render more than ocular inspection necessary. The terminal edges of the metamorphic beds, plained to a smooth bevel, support an even four feet aggregation of beds of hard, coherent durable, grayish white, silicious and not very fine conglomerate, divisible into layers of two feet and under (which would probably yield very good mill-stones,) with a dip S. 26° W. $< 38^{\circ}$, followed by a great collection of limestones and shales having many fossils in common with the calcareous deposits of Gaspé, and exceeding them in thickness. It is upon the basset edges of these, where the beds dip S 20° W. $< 45^{\circ}$, about two hundred and thirty yards along the beach from the millstone layer, in a cliff one hundred to one hundred and twenty feet high, that the upper conglomerate rock is seen to repose with a dip S 20° . E. $< 20^{\circ}$; and while the conglomerate stretching two hundred yards along, presents a perpendicular face, the lower formation offers a talus up to it, and occupies sometimes more, and sometimes less than half the cliff. The conglomerate is here of a deep red colour, and it holds many boulders as well as many pebbles of various kinds. Those of red sandstone are the most numerous, and some of them would weigh one hundred weight; others of a silicious conglomerate would not be under seventy pounds; some limestone pebbles containing organic remains might weigh ten pounds, while a few boulders of compact limestone would give two hundred

weight, and there was one in particular of this quality which could not fall short of half a ton.

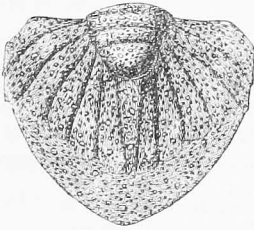
In the next ten miles along shore, there are only two patches of the upper rocks, but the calcareous group which supports them, presents a conspicuous figure. As displayed in the coast cliff the base of it is the four feet bed of millstone conglomerate, to which allusion has already been made, and the following is the series of deposits resting on this in an ascending order ;

	Feet.
1. Reddish gray micaeco-arenaceous limestone weathering of a dull ochre yellow, interstratified with six bands of silicious conglomerate, of which the four feet millstone bed is one, and abundantly stored with fossils.....	140
2. Greenish calcareous shale with many nodules, and a few beds of yellow weathering limestone, and holding many fossils.....	200

(After this there is a break in the succession, occasioned by a fault which creates a short interval of great confusion ; but though the cliff is filled with a beautiful picture of the entangled details of the disruption, it is not high enough to afford evidence of the amount of displacement. Judging, however, by the difference of colour in the strata on the west side, it appears probable a downthrow in that direction is the result, occasioning no repetition to exaggerate the apparent volume of the formation. On the west side of the fault, the following is the succession ;)

3. Hard gray limestone in beds of six inches to a foot.....	50
4. Red micaeco-arenaceous shale, with very few fossils.....	200
5. Gray limestone shale inclining to green, with many corals.....	900
6. Gray or greenish limestone, partly of a slaty character, full of organic remains, with a band of yellowish gray calcareous sandstone, in the centre, equal to about half the amount, yielding excellent tile and flag stones	150
7. Greenish calcareous shale with fucoids.....	500
8. Measures concealed, probably of the same quality.....	500
9. Gray limestone in beds of six to eight inches with corals, and shells.....	200
10. Light gray compact limestone with indistinctly marked divisions into strata, full of corals broken encrinites and bivalve shells, with trilobites. Here and there a deposit of red arenaceous limestone runs for a short distance in the supposed direction of the strata. These are interrupted by shapeless lumps of compact limestone, and through the red layers white cylindrical corals are observed to pierce or in them white broken encrinital columns to lie enclosed.....	500

Among the fossils at the base of the preceding section *pentamerus oblongus* occurs ; and at the summit, associated with *atrypa affinis*, and two other species strongly resembling *a. pugnus* and *a. lachryma* fragments of a singular trilobite are found, probably belonging to the genus *brontes*. The head and tail-plate are



Brontes? Canadensis.

represented in the accompanying wood cut. They are not taken from one specimen, but made up from several, namely, two of the head and four of the tail; and although it is not doubted that all the parts of each member are correctly and proportionably given, it is not so certain that an exact proportion is preserved in the relation of the one member to the other. If not previously known, I should propose to give the fossil the specific name of *Canadensis*. Another species accompanies it in considerable abundance, of which the post-abdominal part strongly resembles *brontes flabellifer*, except that the surface is smooth.

With it a head-plate is found in equal abundance, with a surface of so similar a texture, that it appears to me probable both parts belong to one species. The head, however, does not at all resemble that of Goldfus' figure of *flabellifer*, as given in Lyell's Elements. The head of another trilobite armed with spines occurs.

The lowest members of the above mentioned series of deposits, to the sixth inclusive, form the eastern part of L'Ance à la Veille up to the brook. The seventh and eighth constitute the remainder of that cove, and also L'Ance à Gascon, while the ninth and about seventy feet of the tenth compose Pointe à Bouleau, separating these two coves; but the Gros Morbe, between L'Ance à Gascon and L'Ance à la Barbe, displays the whole thickness of both. These constitute also the coast nearly the whole way to Port Daniel by Herrington Cove, and the two conspicuous points on the east side of the bay—of which the northern is called the Devil's Cape—exhibit the upper limestone in a nearly vertical position, with its encrinal character well marked. It is again seen on the front of Mr. Carter's land, between the great and little lagoons, and following up the West river a few miles, it is found to cross it several times, first with a south-west dip, then with a north-west dip, and though I did not trace the stream far enough up to meet with it a third time (not having extended my examination beyond five miles,) I am ready to believe it will once more be found with a final south-dipping outcrop higher up.

Following round Port Daniel Bay from the exit of the little lagoon, the strata are covered over by sand and gravel for upwards of a mile, beyond which the green calcareous shales of the lower part of the formation are seen first dipping northwardly then southwardly; and finally, resting upon them, the upper limestones are again displayed in the South-west Point, whence they run along the coast for two miles to Mr. George McDonnell's lot No. 26, not far from Indian Point, where they are once more concealed on the coast by the upper unconformable red sandstone and conglomerate.

The base of the calcareous group in the vicinity of Port Daniel is probably near the junction of the Middle River with the great lagoon, and from beneath it, higher on the stream, a series of black bituminous graptolitic shales comes to the surface, and is seen at intervals for several miles upon its banks. The position of these shales is interposed between the calcareous group and the metamorphic rocks of Point Macquereau; and while their absence in the coast section is easily accounted for in the unconformability of the over-lying formation, their relation to the lower rocks draws closer the analogy between these and the rocks of Notre Dame; and at the same time the discordance on the Bay Chaleur, between the calcareous group and that beneath, tends to excite a suspicion, in the absence of better evidence, that the same discordance may exist on the St. Lawrence.

Some part of the black shales holds a sufficient quantity of bitumen to yield a bright flame when subjected to a strong heat. This property, in combination with their colour, has in this, as in other instances, led to a strong opinion and extensively circulated reports that they are associated with coal-seams. But the view which the facts ascertained in the vicinity lead me to entertain of the age of these rocks, would place them, as will be seen from the sequel, in a much lower geological position than the carboniferous deposit, and render the discovery of profitable coal-seams in them contrary to present geological experience.

The Port Daniel limestone is of excellent quality for burning, and serves well either for masonry or for agricultural purposes. Within the last two seasons several schooner cargoes of it have been shipped to Prince Edward's Island, and as calcareous rocks have not, I believe, been met with in that Province, and are absent from a considerable portion of the Gulph and Bay shores of New Brunswick, it is probable the demand for it will increase.

Not far to the westward of the brook in L'Ance à la Veille, there

are some calcareo-arenaceous strata which split readily into large and very even and regular plates of almost any thickness, from a quarter of an inch up to three or four inches, if required, in consequence of a small quantity of mica in the divisional planes. From these very beautiful flag and tile stones might be obtained, and the bed of silicious conglomerate at the base of the coast section of the calcareous group, as well as others of much the same quality and of greater amount on the West River, would yield very fair mill-stones.

Returning to the upper unconformable rocks, there are between L'Ance à la Veille and Indian Point, two localities, where patches rest on the Port Daniel limestones. One of them is Herrington Cove, where about forty yards breadth of it is seen, and where its enclosed masses are fragmentary, belonging apparently to the underlying strata. The fragments are large, and one protruding from the enclosing red sandstone, could not be much under eight tons in weight. The other patch occupies the banks of a small brook flowing into Port Daniel Bay, a little to the east of the exit of the great lagoon. From the mouth of the brook it runs up the dingle, and crosses the road about a mile east of the sand beach. It is a strip which, occupying a valley in the original surface on which it was deposited, has been protected from destruction by the fences of older rock on each side of it.

From Indian Point a great stretch of this formation, with only such occultation as results from the sand beach of Nouvelle, and that of Paspébiac (to the landward of which latter place, however, there is a precipitous bank clearly marking its presence,) carries us to New Carlisle; and in this distance of twenty miles, in which its prevailing quality is that of a red sandstone with only a few conglomerate layers, the rocks on which it rests are seen at high water mark only in the first part as far as Cape Loup Marin, and again at Point Mashigoweech.

Under a mile and a half from New Carlisle town lot these again appear, presenting at the same time a new feature in the coast section. Proceeding westward the upper rock, consisting chiefly of red sandstone, has a gentle dip eastward, not exceeding one or two degrees, and it reposes upon the truncated extremities of a vast collection of trap dykes, not much under fifty in number, and of various qualities and breadths, from eighteen inches to twenty feet, which cut through the lower formation consisting of red calcareo-arenaceous shale, with a few thin bands of limestone. The trap is often a

greenstone porphyry, containing tabular crystals of feldspar, which stand edges upwards, with their flat faces to the walls of the dyke towards the sides, but occasionally across the dyke in the centre. Reaching the town lot, the overlying red sandstones cease, and the trap spreads out under nearly the whole of it. It is of different qualities in different places. A ledge of it, running N. E. and S. W. in one spot consists of greenish white feldspar, with black hornblende, and a small quantity of black mica; but in another, to the south of this, the feldspar assumes, when weathered, a light, flesh-coloured tint, and the trap is nearly made up of it. This is on lot 37, the property of Mr. Thompson, and it there seems to hold a small vein of oxidulated iron ore, which, from the decomposed condition of the rock, it was found impossible to trace to a distance; but I was informed that for several scores of yards about the spot, lumps of micaceous iron ore, of which I saw several, were frequently turned up by the plough.

The breadth inland of the upper rocks, in the vicinity of New Carlisle and Paspebiac, is rather over two miles. They extend to the foot of a hill composed of the upper Port Daniel limestones, which rises rather boldly to the height of about three hundred feet, and runs in a direction to join the limestone in the vicinity of Mr. Carter's land. At the base of this hill, there are four or five small lakes, on the bottoms of which, and extending in the valley they occupy, probably even further than their boundaries, there exists a very valuable deposit of fresh water shell marl, varying in thickness from one to six feet, and even more, and consisting of a white mass of comminuted shells, having much the aspect of whitening. The area occupied by the lakes is about three miles in length, by about half a mile in breadth, and while their bottoms shelve so gradually, that when the water is low a considerable rim of the marl is exposed, there is some evidence that it also extends under the peat and vegetable mould accumulated on the margin. There is no doubt, therefore, a vast supply of the material might be obtained. Peat, another material of agricultural importance, is extensively spread in the same locality; and both will afford the Agricultural Society, which has just been so beneficially established in the vicinity, an opportunity of pointing out the well-known advantages to be derived from them as manures, when judiciously applied, and of varying and extending the experiments that have been

instituted for the improvement of the district, with seaweed and marsh mud, which also abound in the bay.

It may be here mentioned that another deposit of fresh water shell marl exists at the village of Malbaie, a few miles from Point Peter. It is six feet thick, and it is covered by about eighteen inches of peat. Its extent, however, is very limited. It is confined to the eastern side of the brook there, and it is not likely that it occupies more than two hundred and fifty yards square, being merely the remnant of some more extensive area, now broken and worn away by the gradual destruction of the coast. It is now in contact with the salt water of the bay, which is gradually making inroads upon it.

From New Carlisle to Red Cape, and a little beyond it, in New Richmond Township, a distance of about twenty-three miles, the coast line displays the upper red sandstone, with the exception of about five miles at the mouth of the Bonaventure or Wagamet River, where it is covered over by tertiary clay, holding *myæ*, *saxicavæ* and other genera of marine shells. But it was noticed five miles up the Bonaventure, by Mr. Murray, and it is probable it has a breadth of four in the Township of Hamilton.

At Capeling River the deposit has the character of a conglomerate, with limestone pebbles, and the beds lie nearly flat; but at Red Cape they dip south at an angle of twenty degrees, and about five furlongs further, suddenly turning down to a dip S. 55° W., with an inclination of 55°, they abut against a great mass of trap, which extends about a mile along the coast and constitutes Black Cape at its termination. The direction of the dislocation is N. 35° W. and at the junction of the rocks the conglomerate is composed of boulders, and great fragments of trap in the usual matrix of red sandstone, and large calcareous pebbles holding organic remains, which correspond with those of the upper limestones of Port Daniel.

In the coast section the trap is of a more homogeneous quality on the east than on the west side being in the former of a uniform olive green colour, with many exterior stains of red oxide of iron. On the west side it is interstratified with several beds of reddish white limestone, identical in quality with the upper rock of Port Daniel, which run up into a cliff of fifty feet, with a south dip, at an angle of 64° to 68°, and it consists of a very heterogeneous mixture. With a general purplish rusty exterior much of it is of an interior dingy

bottle-green. It includes large irregular fragments, much of its own colour with a faint dash of red, which appear to have been intruded into it when it was soft; these fragments are harder than other parts. They resist the weather better, and they stand out in bold relief, sometimes with smooth faces resembling great crystals. Associated with these are large enclosed apparent fragments of amygdaloidal trap holding carbonate of lime, and these also occasionally start out in bold relief. Fragments of red indurated shale are not unfrequent, and fragments of limestone of the same quality with that of the beds near are very common. These retain their original reddish white colour, and many of them have organic remains, which are beautifully weathered out, being all corals and encrinites. Where the limestone has not been acted upon by the weather, the organic remains cannot be detected. The hard trap fragments contain none of the organic limestone; the amygdaloidal ones hold occasional pieces, but the chief part is in what may be called the general paste of the mass. This lower part of the trap has much the aspect of having resulted from a flow of viscid matter which had rolled over on its own crust, enclosing fragments of it, and of every thing met with in its progress. In another part, which seems to be disposed in beds, it consists of a collection of trap boulders or pebbles and fragments, held together in a trap cement. All these characters accord with the position the trap bears to the strata to the west. It rests upon them, and it is not an improbable supposition, that it was poured out over them at successive epochs, when they were in a horizontal position. If this be correct the thickness of the mass, resulting from the data displayed on the coast, including the limestone beds interstratified, would be six hundred and fifty feet.

The strata to the west possess generally the same qualities as those of Port Daniel; they have a limestone of the same character at the top as the upper rock there, and another at the base much resembling that of L'Ance à la Veille; while the intermediate mass, as a whole, is very similar to that of L'Ance à la Veille and L'Ance à Gascon. But the total amount in this vicinity, as developed between Black Cape and Mr. W. Cruger's lot, No. 37, more than doubles the other, wholly from an augmentation of the central part of the deposit.

From Mr. Cruger's lime rocks, which are just one mile east of the cove at the mouth of the Little Cascapedia River, and run inland

with a general strike S. 75° E. the whole coast to the mouth of the Great Cascapedia, is occupied by tertiary clays, with their usual accompaniment of marine shells. In a section of the cliff on Mr. Brown's land, lot No. 27, the genera *mya* and *saccicava* occur in clay bed over clay bed, up to the height of seventeen feet above high water mark, in the position they occupied when in life, each bed being separated from the one below by a thin layer of sand, from which the pipe by which the inhabitant of the shell had communication with the surface is filled up.

From the clays between the Little and Great Cascapedia Rivers, it is probable very good common bricks might be made, notwithstanding it is said that a rude attempt at the manufacture of them some time ago did not prove successful.

On the west side of the Great Cascapedia the unconformable conglomerate again makes its appearance. It is seen in a conspicuous hill, in which the strata gradually rise from Indian Point, attaining an elevation of 378 feet on Mr. McKay's land. It composes not only the hill but the flat valley beyond, which holds a very thriving settlement upon it, much incommoded by the want of a road, and comes out on the river higher up. From Indian Point its stretch up the river may be four miles, and reaching the base of the mountains which present a flank running for the Peak of Tracadigash, it skirts the Bay up to the dividing line between the Townships of Maria and Carleton, with the breadth of a mile and upwards, though it is not seen on the coast, being there covered over from Indian Point with the tertiary deposit.

Judging from the journeys made across the Gaspé and Bonaventure Peninsula by the Chat and Cascapedia, and back again by the Matapedia, the mountain flank alluded to, which continues up the Bay as far as my examinations extended, is the southern boundary of what may be considered a table land extending across to the St. Lawrence, on which the mountains of Notre Dame are a conspicuous range of highlands, while the river courses are deep and narrow excavations cut out of the block. That part of the flank, which reaches from the Cascapedia to the peak of Tracadigash, appears to be composed of a coarse silicious conglomerate, standing in a vertical attitude, and to run southwest in the strike of the measures which present several remarkable precipices. But between it and the upper, or flat calcareous conglomerate in front, there stand a few

successive isolated trap hills with conical summits, occasionally half resting on the flank, and the breadth these occupy indicates that the trap range, with which they are connected, is of some importance.

From Tracadigash Peak the border of the table land changes its direction, running parallel with the coast a little to the north of west, and makes a partial section obliquely across the measures, exhibiting in succession dark coloured slates, several masses of trap, and finally a great calcareous deposit, which seems to run inland to the north of the silicious conglomerate. It is probable, however, that the strike and the mountain flank again coincide further on, for there is trap at the foot of it associated with limestone beds at Nouvelle Bridge, five miles up from the mouth; again at the bridge over the Scaumenac, a mile from its mouth; and finally trap comes upon the Restigouche on the land of Mr. John Adams, at the junction of the Little River with the main stream, from which stream it is separated, between the Scaumenac and the Little River, by a margin of silicious conglomerate, very like that of Tracadigash, seen in vertical or highly tilted south-dipping strata below Mungo's Brook, at Point La Garde, and at Point Bordeaux.

The valley of the Little River makes a section across the trap mountains, and proceeding up the Kemp or Metis road which runs in it, the breadth of the igneous range is found to extend to the bridge across the stream, a distance of two miles. On Mr. Neilson's land, lot 17, close by the bridge, fossiliferous limestone crops out, succeeded further back by calcareo-argillaceous and arenaceous shales, followed still further on, beyond Mr. Dickson's, by thin bedded limestones and dark coloured shales. Near the Little River bridge, a tributary coming from the west, joins the stream. Following up the valley of this, it is found to head with another brook which flows in a contrary direction in the same depression, and comes out on the Restigouche, just below Bracket's Point; and the fossiliferous limestone, no doubt following the valleys all the way, comes out with it. The trap mountains occupy the whole of the triangle between the valleys and the main river, and just at the termination of the Mountains at the apex of the triangle, the igneous rocks are seen interstratified with the limestones. On Andrew's Brook near the mill, are exposed some of the fossiliferous strata, and again below the mouth of Seller's Brook; and the thin bedded limestones, (in which I could perceive no fossils,) come upon the Restigouche at and below the mouth of the Matapedia River.

Returning down the Restigouche on the opposite side, the trap range is again found there. The Sugar Loaf Mountain near Campbelltown, judged of by what is seen on its northern side, is a mass of trap, and so is the chief part of the rocks, which occupy a position between the brook at its northern base, and the Restigouche. On the margin of the river, however, the silicious conglomerate is seen; and at Mission Point just in front, greenish gray sandstone of the same formation is displayed. The strata in both localities dip northward. Lower down between Shaws' Brook, and Point La Lime, igneous rocks are again visible; they are here composed of red feldspar, and black mica, and are interstratified with the conglomerate (composed altogether of igneous pebbles) which runs along the beach for some distance down to Pointe La Lime. A little below the point there occurs, associated with the conglomerate, a thin seam of carbonaceous shale, with a bed of clay below it, which has induced hopes of coal in the minds of the inhabitants; but it does not appear to me to promise more than the thin seam which has been noticed on Gaspé Bay. The same seam is again seen at Pointe Pin Sec, where, resting on its subjacent argillaceous bed, it is covered by a roof of trap, the contact of which has altered its condition to a hard black stone. A conglomerate bed again occurs further on, from beneath which, between the spot where it is seen and Pointe Peuplier, there comes a red shale, altered to a condition, which the Indians find favorable for the manufacture of their calumets, which they carve from it with their knives. The rocks seen along shore between this and Dalhousie are nearly all trap and in the beautiful transverse section of the trap series (exceeding a mile,) which occurs in the vicinity of Cape Bon Ami, the igneous layers are found to be interstratified with limestones and calcareous shales, having several of the fossils of the Cape Gaspé formation and present a northern dip.

The inference to be drawn from these details is, that the lower rocks of the valley of the Restigouche, from the mouth of the Matapédia downwards, constitute a trough, in which, without referring to the relations of what may be farther down in the series, are displayed a calcareous and a silicious deposit, (probably contemporaneous with the Gaspé limestones, and their superincumbent conglomerates and sandstones,) with the interposed products of a volcanic era, whose influence, it is not unlikely, has been powerful in this district of America; for the facts observed on the Restigouche River, accord with those of Black Cape, and those of the Conical Moun-

tain on the Cascapedia, and will probably, in the end, be found to have a relation to those of New Carlisle.

On this trough of lower rocks unconformably reposes the upper calcareous conglomerate. Its northward limit is the mountain flank of the Gaspé and Bonaventure table land, which it follows in the line which has been described, turning sharp up to a nearly vertical position, for a short distance, as it approaches the trap range, and always leaving between its visible basset edge, and the mountain flank a geographical depression, a part of which has been very conveniently and judiciously used for the line of new road between the Nouvelle and the Scaumenac. Between Tracadigash and the Nouvelle River, the strip the upper conglomerate occupies on the coast is flat and narrow, the width not being a mile. But between the Nouvelle and the Scaumenac though its dip is gentle, it rises into a hilly surface, occupies a breadth of about four miles, and constitutes the coast from Maguasha Point to High Cape, where it terminates westwardly in the district which has come under my examination.

On the New Brunswick side of the Restigouche a small patch of it, lying unconformably on the trap and lower conglomerate of Pointe La Lime, is seen on the south side of the Campbelltown road, just in the rear of the point. None of it was observed at Dalhousie, and not having examined the coast between that and Jacket River, I am not acquainted with its distribution there. But I believe Heron Island belongs to the formation; and between Jacket River and Bathurst it is in many places displayed in juxtaposition with fossiliferous limestones, trap, and silicious conglomerates which are repeated several times in the distance, through the influence of undulations, and on which it rests unconformably in a flat position.

The flat red rocks in the vicinity of Bathurst belong to the formation, and at the Victoria mines situated on the left bank of the Nipisiguit, one mile up from the town, they are found to contain vegetable organic remains partly converted into coal, and partly replaced by gray sulphuret of copper, in a manner similar to these observed in the rocks of the Nova Scotia coal-field at the Joggins, on the bay of Fundy.

At this spot on the Nipisiguit an attempt was made by the Gloucester Mining Company, established through the enterprise of Mr. W. Stephens of Bathurst, to work the deposit for copper ore; but the irregular distribution of the organic remains rendered their ope-

rations uncertain, and induced the abandonment of them. Mines of this character have, however, occasionally been successful, and a locality which I had occasion to visit in 1834 in the Spanish Pyrenees near Marc Anton and Hechos, to the west of the Urdax and Canfranc road, presented a combination of coal and gray sulphuret of copper occupying the forms of vegetable remains, in a regular eighteen inch bed, seen to crop out all around a considerable mountain, and promised a profitable return. On the Nipisiguit the bed in which the cupriferos remains are disseminated is about two feet thick, but in one direction it appeared to thin away to nothing in the space of thirty yards. The following is a section of the measures at the place.

Section of Measures displayed in the left bank of the Nipisiguit River at the Victoria mines, one mile above Bathurst, in descending order. The dip of the strata at the place is S. W. < 2° but higher up the river it is reversed to N. E., shewing a gentle undulation, authorising the assertion that the measures are on the whole nearly horizontal.

Chocolate-red micaceo-arenaceous shale, with crack casts.....	30 0
White quartzose conglomerate, irregular in its thickness. At the thickest part it is two feet, and it tapers to two inches in the space of fifteen yards. The bottom is very white, consisting of white feldspar imbedding white quartz pebbles, some of which are as large as pigeon's eggs.	1
Whitish-red argillo-arenaceous shale, being a passage to the next bed below...	0 6
Bluish gray argillo arenaceous shale in parallel layers. It thins out in about thirty yards up the stream. It is charged with the remains of broken plants, some of which are replaced by gray sulphuret of copper, coated with a thin covering of green carbonate ; some are partly replaced by the copper ore, and partly converted into coal, while others are wholly converted into coal. Small nodules of gray sulphuret of copper occur, chiefly in the lower part, and nickel (it is said) has been found in some of the nodules. The greatest thickness of the bed is four feet.....	2
White quartzose conglomerate, similar to the roof. This does not thin out as far as examined, namely about fifty yards.....	4
Red conglomerate, with white quartz pebbles, of which some would weigh three ounces.....	6
Red shale.....	6
Red conglomerate with quartz pebbles, some weighing five ounces and some one and a half pounds.....	10

59 6

At the Rough Waters, three miles up the Nipisiguit from Bathurst Harbour, these red rocks are found lying horizontally on granite and filling up the inequalities of the granitic surface. The granite, is fine-grained, and it is composed of white feldspar, colourless transparent quartz, and black mica, and has a speckled appearance. At

the immediate junction of the two rocks, the red beds seem slightly harder than in other parts, and the granite softer than elsewhere. The feldspar is very white and opaque, the quartz still colourless and transparent, but there is less of the mica; and two or three feet of the surface has a shaly character, as if it had been in a loose state when it became covered up, and had assumed an imperfect stratification. In some places the lowest of the red strata are abruptly terminated against a vertical granite ledge, and present the semblance of a dislocation at the spot; but the even continuity of the overlying beds plainly shews this to be the result of original deposit on an uneven surface. Where the junction of the red rocks and the granite is first seen the former are thirty feet thick, but as the surface of the latter gradually rises up the river, while the red strata maintain their horizontality, these gradually thin out and terminate. Mr. Stevens informed me that the granite subsequently extends sixteen miles up the river continuously, beyond which mica slate makes its appearance, and alternates with clay slate for four miles. At the Rough Waters there is an elvan course, consisting of reddish compact feldspar inclosing red crystals of feldspar, with an underlie, S.S. W. $< 60^\circ$; and granite of the same quality as that of the Rough Waters is seen two hundred and fifty yards up the Middle River from its junction with Bathurst Harbour.

Proceeding along the coast below Bathurst, after an interval of sand, red sandstones again occur at Salmon Beach, four miles from the entrance to the Harbour. They are exposed for one hundred and fifty-six yards across the measures, and their dip appears to the N. 60° E. $< 9^\circ$. Five miles further, after another interval of sand, a succession of greenish gray sandstones, no doubt overlying the former, make their appearance, dipping N. 40° E. at an angle not exceeding one or two degrees. These commence at Upper Ellis Brook, west of Cranberry Cape, and the measures to the eastward are not again concealed for a very considerable distance along the coast. My examinations extended to Point Dumai, twelve miles from Cranberry Cape; and the continuous succession of beds which could be seen and followed in cliffs varying from twenty to one hundred feet in height, amounted to within a trifle of 400 feet. The section is given in descending order in the Appendix, and by reference to this it will be seen that two regular coal seams occur, (too thin however to be workable,) of which the upper one is overlaid by a top-stone, filled with a variety of ferns and other coal plants; and both rest upon argillaceous beds.

holding the *stigmaria ficoides*, the most common plant of the carboniferous series of rocks.

In thus tracing the upper conglomerates and sandstones round the Bay Chaleur to Bathurst, their relation to the nearest coal seams of the New Brunswick carboniferous area is made out with a considerable degree of certainty. The general dip of the Canadian part of the deposit accords with this relation; its slope towards the bay would carry it beneath the coal-bearing strata on the south side, while no rock of a similar quality is there seen to overlie the coal measures. The direct evidence of organic remains has not yet been made available, seeing that the only fossils the Canada beds have yielded are certain large plants converted into coal, and while the external markings of these give nothing characteristic, there is no lapidary in the City to effect sections of them for the microscopic examination of their structure. These plants occur in the vertical beds near to Maby's Brook, in MalBay, and though there is little doubt they will be found to corroborate stratigraphical evidence, they do not afford any hope of coal seams in the vicinity.

The conglomerate rocks with which they are associated appear to be the very base of the coal series, in so far as Gaspé is concerned, and their distribution in Canada is just sufficient to shew that a very narrow margin on the north shore of the Bay Chaleur may be considered the limit in that direction of the great eastern coal-field of North America.

I have the honor to be,

Your Excellency's most obedient servant,

W. E. LOGAN,
Provincial Geologist.

REPORT

OF

ALEXANDER MURRAY, ESQ., ASSISTANT PROVINCIAL GEOLOGIST,

ADDRESSED TO

W. E. LOGAN, ESQ., PROVINCIAL GEOLOGIST.

WOODSTOCK, *20th April*, 1845.

SIR,

Pursuant to the instructions I had the honor of receiving from you, at Paspebiac, I proceeded on the 17th September last, with four Indians and two canoes, to make an examination of the Wagamet or Bonaventure River.

On reaching its mouth, we found the river so low, in consequence of the drought which had prevailed for some weeks previously, that apprehensions were entertained, it might not be practicable to ascend it with our canoes, so heavily loaded as they necessarily were. It was, therefore, thought expedient to hire a third canoe and two more Indians, who were sent in advance with a portion of the provisions, being directed to deposit them in security about thirty miles up the stream.

An examination of the mouth being completed, on the 18th we ascended the river, measuring our distances as we proceeded, by the micrometer telescope, determining our bearings by means of a prismatic compass, and registering with these a description of the rocks exposed on the banks, and the character of the country through which the stream flowed, as well as barometrical observations for the determination of heights. Specimens of rocks and fossils were

collected, but the scanty room afforded by our canoes for transporting them, necessarily rendered the number limited.

Having by the second of October, completed the survey of about fifty-three miles, we found our further progress obstructed by a solid *jam* of drift timber, which blocked up the river for nearly a mile; and a fear that increasing difficulty above the jam would be encountered, as it had been below it, through the shallowness of the stream, particularly in the rapids, (no rain having yet fallen,) induced me to avoid the delay of a portage, and to resolve upon a pedestrian attempt, to reach a lake, said by the Indians to form the head waters within two or three days journey.

Leaving our canoes in security, we took a northerly course, and determining, as we proceeded, several elevated stations on the high land over which we crossed, by bearings taken from the tops of lofty trees, on prominent points previously fixed on our survey lower down, we again struck the river about five miles above the jam. But the breadth it here displayed, which was not under thirty-five yards, and the body of water flowing, notwithstanding its shallowness in the rapids, convinced me we were much further from its sources than my Indians had supposed; and ascending the summit of a mountain which rose abruptly from the river, after having followed the course of this a few miles farther up, we could plainly see the main valley extending for at least ten miles to the northward, and conjectured from the aspect of the country still farther on, that we might be at least twice that distance from its head waters. Under these circumstances, convinced great difficulty would have arisen in carrying the necessary quantity of provisions for the time a proper examination of the country would have required, without the aid of canoes, and fearful our stock might not prove sufficient, it appeared to me prudent to relinquish the attempt. We, in consequence, retraced our steps to our canoes, and descending the river, returned to Paspobiac, which we reached on the 10th October.

Crossing to the New Brunswick side of the Bay, I had an opportunity of making a collection of fossil plants associated with its coal beds, and proceeding thence to Pictou, I returned by the Unicorn steamer to Quebec.

Since my arrival here a plan of the river has been plotted, on the scale of an inch to a mile, on which are detailed the position of the various rocks as they occur; with an indication of their dip; the elevation of particular spots as measured by barometer, over high

water mark ; and a sketch of such prominent points as we approached near enough for observation.

CHARACTER OF THE RIVER.

The Bonaventure falls into the Bay Chaleur, about seven miles above New Carlisle, in the District which bears the name of the river. The entrance to it from the Bay is between two long narrow bars of gravel, one extending from a high bank on the south side, and the other from the flat on which the village of Bonaventure stands, on the north. Inside these barriers there is an extensive basin, measuring from north to south one mile and a half, and from east to west three quarters of a mile, of which space several low alluvial islands occupy a considerable part, and a large proportion on the south side is dry at low tides. The main channel of the river, north of all the islands, is seventy to one hundred yards wide, and is bounded on its north bank by low marshy plains extending towards the village.

From the mouth of the river to the highest part we reached, the general direction is nearly true north, and the distance in a straight line is about thirty-nine miles ; but following the various bends of the stream it would exceed sixty miles. The portion actually measured was fifty-three miles, and forty-nine chains, but this includes a small part of an eastern branch just above the junction of which the main stream is blocked up with drift timber.

In the distance of about eighteen miles from the mouth, the river passes through a level or gently undulating country, producing white pine, balsam fir, spruce, black and white birch, cedar, and varieties of the ash and elm, but the two latter are not abundant. This part constitutes nearly the whole depth of the Township of Hamilton, and in a straight line to the nearest part of the coast may possess a breadth of ten miles. The soil of a large portion, judging from the settlements at New Richmond and New Carlisle, is very probably capable of advantageous cultivation, and an ample supply of water passes through it by various tributaries to the main stream. Two considerable branches flow in from the eastward, one about four and the other about eleven miles from the mouth, and several brooks join on either side. The breadth of the river in the distance varies from three hundred to one hundred feet, and it is bounded by banks in some instances rising to the height of

more than one hundred feet, in others not exceeding ten to twelve feet.

Above these eighteen miles the country becomes more broken and less accessible. Three small hills called the "Three Brothers," rising abruptly from the river to the height of five hundred and five feet above high water mark, are the first indication of an approach to a mountainous region, and the character of one gradually increases proceeding further up. The pine timber, although still abundant, diminishes in quantity, and is of smaller dimensions than lower down, while spruce and fir, though more plentiful, are also of inferior growth.

At the distance of about twenty-five miles and a half from the mouth, a third branch, coming from the northward, joins on the right bank, and at the junction the upward direction of the main valley takes a sudden bend to the eastward, a short distance below which there are strong rapids, called "The Falls" by the lumbermen, though the name is scarcely applicable, as they can at all times be ascended by light canoes. At this point the hills rise to the height of five to six hundred feet above the bed of the river; pine trees become still more scarce, and the inferior order of spruce and fir constitute the prevailing timber, though white cedars of the finest description abound in the low grounds.

The river continues its easterly direction for about six miles, keeping in the strike of the stratification, when it again bends to the northward, and is joined at the turn by a fourth branch from the south. In this distance its breadth frequently contracts into about seventy feet from bank to bank, while occasionally it opens to two hundred or even to upwards of three hundred feet across.

Two branches join the main stream above this; the first, at a distance of about thirty-four miles from the mouth, falls in on the east, and the second, about two and a half miles higher up, on the west side. Hills from five hundred to six hundred feet high occasionally rise abruptly from the river and again recede to some distance, leaving extensive flats along the banks, which, were they in a state of cultivation, I should suppose capable of growing excellent meadow grass, a material that would be of considerable value to the lumbermen as fodder for their cattle. The limit to the operations of this enterprising class of persons is to be found a short distance below the sixth branch and from this downwards a considerable supply of timber is annually driven to the mouth of the river. But

above the sixth branch, pine almost wholly disappears, or at any rate it is either too scarce or too small to attract attention.

Above the junction of the sixth branch, the upward course of the river again bends to the eastward, and continues in that direction for about three miles, presenting frequent rapids, where the width contracts to a space occasionally not exceeding forty feet, with high mountains rising precipitously from the banks; but turning northward, it keeps this bearing to the highest part we attained. The water becomes smooth, the hills open out, and flats bearing heavy spruce and cedar timber extend over a large surface to their base.

The jam which blocks up the main stream, as already stated, is nearly a mile in extent. The water above, dammed back by it, has inundated the flats on either bank, and wearing a multitude of small channels in them, has formed a labyrinth of little islands. Threading our way among these, it was not until we ascended a hill to reconnoitre, 785 feet over the bed of the river, or 1252 feet over high water mark by barometrical measurement, that we discovered we had left the main channel and proceeded a short distance up a tributary falling in from the east. This branch was seldom more than twenty-five to thirty feet across, and the frequent interruptions it presented, resulting from fallen trees and drift timber, rendered our progress so tedious and difficult that a farther ascent seemed impracticable.

The country over which we walked, lies between this east branch and the main stream, and consists of a high table land, reaching the altitude of 1453 feet over the level of the sea, and producing birch, fir, spruce, and a species of larch, known in the country by the several names of tamarack, hacmatack and juniper. The growth of these, among which no pine whatever was seen, was in many places so thick and close, while at the same time the trees were small, that it became necessary to cut a way through for the passage of the party.

With the exception of the timber jam upon the main stream, there appeared no formidable impediment to its ascent by canoes to the highest point we reached, and it seems to me probable that when there is a full supply of water, it might be navigated for a considerable distance beyond.

The Bonaventure is remarkable for the peculiar transparency of its waters, a circumstance observable from its mouth upwards, and one originating the name given it by the Indians, who call it the Wagamet, signifying the Clear Water. Unlike the Chat and the Cas-

capedia, it appears to be almost destitute of fish, for with the exception of a very few salmon, tide trout and eels, which latter do not appear to ascend higher than the first fork, we saw none the whole distance we surveyed; water fowl are likewise scarce, probably in consequence of the absence of fish. The great Merganser duck was the only species met with. Ruffed and spotted grouse frequent the woods: and the wild quadrupeds we saw were the martin, and in great and serviceable abundance the porcupine, while the recent work of the beaver, and fresh tracks of the caraboo, indicated their presence also in the remote regions near the junction of the last tributary.

CHARACTER AND DISTRIBUTION OF THE ROCKS.

The barrier at the mouth of the river, the islands in the basin, and the banks around it, which, on the south side of it and for some distance up the stream, are generally forty to fifty feet high, but sometimes do not exceed ten or twelve feet, are all composed of coarse gravel, having a common origin. It consists principally of limestone pebbles, occasionally holding organic remains, with some of trap similar to that of New Carlisle, and some of a calcareous conglomerate, of which rounded fragments of a reddish-tinged limestone are the predominating constituent. This gravel prevails for about two miles up the river, and at this distance the first section of the older strata is seen, composed of fine-grained green-spotted red sandstone, in which the spots vary from the diameter of one eighth of an inch to that of one foot, and the beds are so nearly horizontal that their inclination is inappreciable. For four miles above this first exposure the banks present sections of the same description of rocks, varied with occasional green layers of the sandstone and interstratified with red shales; and finally reddish limestone conglomerate beds become predominant among them with a gentle inclination to the south west. Where the red colour prevails the sandstones yield easily to the influence of the weather and crumble to pieces; the green variety seems more durable, but the thinness of the beds renders them unserviceable for any useful purpose. The conglomerate is composed chiefly of rounded pebbles of limestone, displaying on fracture a gray colour in the centre, and gradually assuming a pinkish hue towards the exterior, at which they are red, being probably tinged by the material cementing the aggregate together.

At the highest point on the river where the conglomerate beds are exposed, they are seen at the top of a bank one hundred feet in height, the base of which is covered up by a mass of detritus derived from them, concealing the stratification; but a short distance down the stream there is evidence that they rest unconformably on a set of calcareous and silicious rocks, the superposition of which at the spot in a descending order, is as follows.

	Feet.
1. Gray thin and regular-bedded calcareous and arenaceous slates or slaty sandstones, splitting into laminae of one quarter of an inch thick.....	114
2. Dark gray slightly twisted slates with an uneven fracture.....	513
3. Gray slightly calcareous sandstones of which the lower beds approach to a gray or greenish coloured arenaceous shale.....	86

Above the final outcrop of the overlying conglomerates and as far as the second fork or tributary, frequent sections of the subjacent rocks are presented. These constitute a second series underlying the foregoing section, and they consist of gray or greenish gray silicious limestones; green hard and compact silicious sandstones; beds of fine grained conglomerate composed of small pebbles of quartz and feldspar; and greenish gray calcareous and arenaceous shales. In these deposits, which are given in their apparent descending order, no fossils were detected, though from evidence collected higher up the stream, it is not improbable some may exist. But in a third and sequent set of rocks, consisting of greenish gray calcareous slates interstratified with thin beds of gray limestone, seen dipping uniformly southward on the south side of the second fork, at an inclination varying from 25° to 35° , fossils are abundant. From the base of these slates, which are affected by a double system of cleavage joints,—one plane running in the direction of the strike and dipping $178^{\circ} < 75^{\circ}$, while the other dips $23^{\circ} < 64^{\circ}$,—to the summit of the strata seen supporting the unconformable conglomerate, the total thickness of the deposit, should there be no fault or inversion, and there is no evidence of any, cannot be far short of six thousand feet, and the whole rests upon a set of thick bedded silicious limestones holding organic remains, among which one peculiar species of bivalve shell is found in great abundance. Where these limestones are first met with, their dip is $274^{\circ} < 9^{\circ}$, and gradually veering round to a more northerly slope, they exhibit the axis of an anticlinal arch, at the same time displaying a section giving 413

feet in thickness, beyond which the slates overlying them measuring eight hundred and eighty five feet thick, are repeated, as well as the superior deposits, the dip becoming more and more northward advancing up the stream and at last pointing in the direction 344° , with a slope of 30° .

On the north as on the south side of the anticlinal axis, fossils abound in the slates, consisting of corals and shells, among which the genera *Leptæna* and *Atrypa* prevail. The fossils being generally deposited in distinct layers are the best if not the only means of distinguishing the bedding; but affected by the molicular action from which the cleavage has resulted, they are frequently distorted, and then becoming obscure and indistinct they are difficult to procure entire.

The slates split into thin laminae, which, however, are too rough and irregular on the surface to be of any value for roofing purposes, and the limestones which support them are too silicious for burning, though they would make good building stone.

Succeeding the slates, superior rocks, similar in character to the second series seen below the fork, occur, consisting of green or greenish gray calcareous and micaceous sandstones, generally very hard and compact; beds of fine conglomerate, composed of quartz and red feldspar pebbles, and brownish gray calcareous and arenaceous shales; above the whole of which are a set of fossiliferous limestones which probably belong to the second series, though fossiliferous strata were not observed in this position on the south side of the anticlinal axis. On the north side of the axis, however, fossils are occasionally detected through the whole series, the shell found in the intermediate parts in the greatest abundance being a small bivalve similar to the one occurring in the lower limestones at the second fork. The upper limestones, which are met with about halfway between this tributary and the Three Brothers, contain numerous univalves, several bivalves, and a variety of corals, among which the genus *Catenipora* was seen. Their thickness was estimated at about five hundred feet, and as in the case of the inferior limestones, though they might serve the purpose of a building material, it is doubtful if they are of a quality fit for conversion into lime by the kiln.

About three-quarters of a mile above the Three Brothers there is a supposed repetition of these upper limestones, with a southerly

dip, forming a trough between the two points of their display ; and the following section in ascending order occurs at the spot :

	Feet.
1. Greenish-gray and greenish thin limestones, which contain numerous fossils, chiefly small bivalve shells, a few ennerinal columns and corals.....	57
2. Green compact sandstones : the lower beds parted by green arenaceous and micaceous shales ; the upper beds micaceous and calcareous.....	26
3. Red and green fine-grained conglomerate beds, composed chiefly of pebbles of white quartz and feldspar, and black hornblende ; the upper beds coarser than those below.....	15
4. Green micaceous and calcareous sandstones.....	8
— 49	

The sandstones which here follow the limestones are represented by rocks of a similar lithological character on the south side of the trough, and other sandstones succeed on both sides to the foot of the Three Brothers Mountain ; while the mountain itself is composed of additional strata standing in the centre of the trough. They consist of green calcareous sandstones, in thick massive beds, seen at the base ; which are surmounted by granular red and compact greenish-coloured sandstones, with carbonised comminuted plants and indistinct shells, exposed on the sides ; while at the summit are obscurely displayed, succeeding beds approaching a conglomerate in character.

Affected by the undulation producing the trough, the slates which have been mentioned as occupying a space at the Second Fork, sweep round in their relative position, and appear with a southerly dip at the Falls, four miles above the Three Brothers. But they are seen a little way farther on at the mouth of the Third Fork with a northerly dip, distinguished by obscure fossils, which there mark the bedding, and they occupy the valley of the river, which is worn out in their strike in an eastwardly direction, as far as the Fourth Fork. The general depression in which this part of the river flows is about parallel to the valley of the Second Fork, and the analogy between the geological and geographical relations of the two cases is carried still farther in the fact that the same slates are affected by an east and west anticlinal axis in each. In the more northerly instance, however, the lower limestones, which are displayed on the Second Fork, do not come to the surface.

Above the Fourth Fork, where the valley of the river again assumes a north and south course, sandstones, slates, and limestones occupy about seven miles, and from the geographical position they hold, with relation to the slates folding over the higher anticlinal

axis, they are supposed to be equivalent to the second series of rocks, described as existing lower down, between the lower and upper fossiliferous limestones. As displayed at different points between the Fourth and Sixth Forks, there is a general resemblance between them in a lithological character, but no fossils were detected to confirm this opinion; and the difficulty of the case is enhanced by the very disturbed condition of the strata. In many cases the measures are so confused by contortions as to defy every attempt to ascertain the general inclination, and in others they are tilted up to a vertical attitude, or to a very high angle, in general sloping to the north. This was the prevailing direction of almost every dip decidedly displayed, but it can scarcely be doubted that these dips are counterbalanced by others, with an opposite bearing, concealed probably amid the contortions, and that the width the series occupies is due to important undulations, and not to the great thickness it must otherwise be supposed to attain.

Ascending from the Sixth Fork, where the river makes another bend to the eastward, it flows in the strike of a set of gray calcareous slates, interstratified with thin beds of bluish-gray limestones, which are overlaid by other gray limestones, and gray hard calcareous sandstones, containing numerous crystals of iron pyrites. Their dip is $340^{\circ} < 70$, and coinciding with it the cleavage of the slates is smooth and regular, facilitating their division into firm slabs of large size and of various thicknesses to less than a quarter of an inch, which would constitute a material well fitted for roofing purposes. The great strength and durability of the overlying sandstones are remarkably displayed among the argillaceous layers, with which they are here associated, from which they stand out in bold and sharp relief, running up with their steep inclination to form the crest of the hills upon the banks, while they occasion rapids in the river, where their outcropping edges run across it.

From the ultimate bend which the valley of the river takes to the northward about two miles above the Sixth Fork, the strata are altogether concealed for upwards of four miles, until reaching the junction of the last branch below the timber jam. Here a new set of rocks present themselves, differing in character from any seen below. They consist of gray micaceous and silicious sandstones, generally slaty in structure, and impressed with carbonised comminuted remains of plants on their surfaces. So far as the examination of the east river extended, their dip was $166^{\circ} < 60^{\circ}$. The same rocks were

exposed on the main river from the point where we struck it after crossing the mountain up to the farthest we attained, and an occasional outcrop of them was seen on the mountain sides, sometimes in vertical strata, and always at a high angle of inclination. In their mineral and fossil conditions, these rocks bear a strong resemblance to some of the Gaspé sandstones, and they are most probably an equivalent of part of the series.

From the mouth of the river to the highest part we reached, its gravel was marked by the presence of trap pebbles and boulders; but as no volcanic rocks were seen in situ, I am led to infer that their parent source will be found near the head waters of the stream, and may be possibly ascertained to have some relation to the range of trap so prominently displayed in the Conical and Barn-shaped Mountains of the valley of the Cascapedia.

I have the honour to be,

Sir,

Your most obedient servant,

(Signed)

A. MURRAY,

Assistant Provincial Geologist.

APPENDIX.

1.

Section of Coal Measures displayed in the cliffs between Cranberry Cape and Point Dumai, on the New Brunswick coast, south side of the Bay Chaleur. The beds are given in descending order.

	Ft.	In.
Greenish-gray sandstone, much of it fit for grindstones. This composes <i>Dumai Point</i> and <i>Pokeshaw Point</i> , and approaching <i>Grindstone Point</i> , it becomes interstratified with occasional layers of red shale,.....	50	0
Red arenaceous shale, becoming occasionally red sandstone...	15	0
Greenish-gray sandstone,.....	5	0
Red argillo-arenaceous shale.....	15	0
Greenish-gray sandstone of an excellent quality for grindstones. This constitutes <i>Grindstone Point</i> , where grindstones are quarried out of it,.....	45	0
Red argillo-arenaceous shale,.....	8	0
Greenish-gray arenaceous shale, in some places along the cliff becoming a sandstone sufficiently hard to resist the effects of weather.....	6	0
Red argillo-arenaceous shale,.....	17	0
Greenish-gray arenaceous shale sometimes a sandstone,.....	3	0
Red argillo-arenaceous shale,.....	11	0
Greenish-gray arenaceous shale,.....	3	0
Red argillo-arenaceous shale,.....	12	0
Green arenaceous shale,.....	2	0
Red argillo-arenaceous shale,.....	12	0
Gray arenaceous shale,.....	2	0
Red argillo-arenaceous shale,.....	3	0
Greenish-gray arenaceous shale, sometimes becoming a sandstone,.....	4	0
Red argillo-arenaceous shale,.....	5	0
Greenish-gray sandstone,.....	5	0

Dark-gray argillaceous shale, with <i>argillaceous iron ore</i> in nodules,.....	2 0
Red argillo-arenaceous shale,.....	5 0
Gray argillaceous shale,.....	1 0
Greenish-gray arenaceous shale in some places becoming a sandstone,.....	4 0
Gray argillaceous shale with <i>ironstone balls</i> ,.....	2 0
Greenish-gray arenaceous shale, in some places becoming a sandstone,.....	6 0
Green argillaceous shale,.....	3 0
Greenish-gray arenaceous shale,.....	3 0
Gray argillaceous, shale with nodules of <i>argillaceous iron ore</i> ,	2 0
Greenish-gray arenaceous shale, in many places along the cliff assuming the hardness and consistency of a sandstone fit for building. In it <i>stigmæria</i> branches occur, and it is said that some time ago there used to be two upright columns, half imbedded in the rock and at right angles to the stratification, well displayed. They were probably upright <i>sigillariæ</i> . The action of the frost and tide, however, has recently broken them down and carried them away,.....	5 0
Dark-bluish-gray argillaceous shale, stored with abundance of impressions of ferns and other plants among which was observable the branch of a <i>stigmæria</i> nine feet long without leaves. On many of the plants, a very minute convoluted shell is seen, and in the shale a small bivalve. In the distance of a mile along the face of the cliff this shale is sometimes six feet thick, and sometimes only one foot, and occasionally it is absent altogether, leaving the overlying sandstone in contact with the coal beneath,	5 0
<i>Coal</i> of a bituminous quality, with a thin seam of iron pyrites (a quarter to half an inch) occasionally on the top,.....	0 8
Gray argillo-arenaceous shale of a tough crumbling quality, much resembling fire clay, abundantly filled with the branches and leaves of the <i>stigmæria ficoides</i> , and having nodules of <i>argillaceous iron ore</i> ,.....	3 0
Green argillaceous shale,.....	12 0
Greenish-gray arenaceous shale,.....	3 0
Red argillo-arenaceous shale,.....	10 0
Green and red shale, with nodules of yellow limestone (with <i>stigmæria</i> ?).....	2 0
Greenish-gray arenaceous shale and sandstone,.....	13 0
Red argillo-arenaceous shale,.....	3 0
Red sandstone and red shale,.....	9 0
Red argillo-arenaceous shale,.....	35 0
Red sandstone,.....	1 0
Red argillo arenaceous shale,.....	5 0

Gray argillo-arenaceous shale, of a crumbly quality, much resembling fire-clay, with nodules of limestone and remains of <i>stigmariæ</i>	3	0
Red argillo-arenaceous shale.....	22	0
Greenish-gray arenaceous shale, sometimes sufficiently consistent to be called a sandstone.....	11	0
Coal said to be of this thickness where bored to in the vicinity.....	0	6
Greenish-gray argillo-arenaceous shale, with <i>stigmariæ</i> (underclay), the thickness is not determined, the whole bed not being visible, say.....	3	0
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Feet.....	397	2

2.

Section of Measures exposed in the cliffs between Point Peter, opposite Flat Island, and the bight of the cove on the north side of Pointe Jaune, or Yellow Head. The dip is constant in direction, but varies a little in inclination, being 121° to 122° < 12° to 22°.

Whitish-red coarse conglomerate. It is composed of pebbles of various descriptions in a matrix of red sand. The pebbles consist chiefly of limestone, with which are associated many of various coloured quartz, slate, and blood-red jasper, several also of sandstone; some of the limestone and sandstone pebbles contain organic remains. The weight of some of the largest of the pebbles is as follows:

White quartz.....	4	lbs	
Blood-red jasper.....	2	"	
Yellow jasper.....	$\frac{1}{8}$	"	
Red shale.....	$\frac{1}{4}$	"	
Red feldspar.....	2	"	
Greenish quartz rock.....	2	"	
Gray, light-drab, and reddish-drab limestone.....	12	"	
Sandstone composed of red feldspar and white quartz.....	14	"	
Calcareous sandstone, with encrinites and atrypæ.....	8	"	58 0
Measures not well seen, being much covered up by sand and shingle, but supposed to be red sandstone.....			90 0

Light or whitish-red limestone conglomerate.....	142	0
Measures concealed by the sand and shingle of Point Peter Cove, supposed to be red sandstone, and softer than the conglomerate.....	218	0
Light-red coarse conglomerate, as before.....	19	0
Measures covered by sand and shingle.....	19	0
Light-red coarse limestone conglomerate.....	22	0
Measures covered up by sand and shingle.....	35	0
Light-red coarse limestone conglomerate.....	187	0
Red sandstone, with a few thin beds of conglomerate.....	33	0
Light-red coarse limestone conglomerate.....	3	0
Red sandstone, with thin beds of conglomerate.....	36	0
Red sandstone, with some layers of conglomerate.....	19	0
Red sandstone.....	6	0
Light-red coarse limestone conglomerate.....	1	0
Red sandstone.....	34	0
Measures not seen, being covered up by sand and shingle in <i>Little Point Peter Cove</i>	103	0
Light-red coarse limestone conglomerate.....	1	0
Red sandstone, with thin conglomerate beds.....	8	0
Light-red coarse limestone conglomerate.....	112	0
Red sandstone.....	73	0
Light-red limestone conglomerate.....	6	0
Red sandstone.....	38	0
Light-red coarse limestone conglomerate. This forms the point south of <i>Whale Head</i>	39	0
Red sandstone, with some fine argillaceous shale beds parting the layers.....	351	0
Pale-red sandstone.....	43	0
Light-red limestone conglomerate. Some of the pebbles weigh 8lbs. They consist of red, green, and yellow jasper, jasper porphyry, syenite, white quartz, and quartz rock; and in the limestone pebbles, which predominate greatly over the others, there are sometimes organic remains. This constitutes <i>Whale Head</i>	11	0
Reddish-drab sandstone, with patches of conglomerate, and of scattered pebbles at the bottom of the beds, near the shale partings which divide them.....	435	0
Reddish and drab sandstone, with scattered pebbles in occa- sional patches, chiefly of quartz.....	109	0
Reddish and drab sandstone, with carbonized comminuted plants on the surface of some of the beds.....	21	0
Reddish and drab sandstone, with some patches of conglo- merate, as before.....	33	0
Reddish and drab sandstone, with a bed of conglomerate at the top.....	93	

Reddish sandstone with a bed of the conglomerate at the top, and another at the bottom.....	21 0
Reddish and drab sandstone with uneven shale partings between the beds, and near the partings fragments of shale are imbedded in the sandstone.....	142 0
Reddish and drab sandstone.....	22 0
Reddish and drab sandstone with a few partings of red argillaceous shale. There are casts of shrinkage cracks on the under surfaces of some of the sandstone beds, and on some of the divisional planes, are carbonized remains of comminuted plants.....	35 0
Reddish sandstone with red arenaceous shale on the top; ripple-mark on the surface.....	5 0
Indian-red arenaceous shale with remains of plants, not carbonized; some of them penetrate the bed at right angles and some oblique to it. Small nodules of calcareous sandstone are seen and some of the plants and nodules are tinged with green.....	16 0
Red sandstone. The full thickness of this bed is uncertain, there being a small fault which brings it in by an upthrow. The underlie of the fault is $200^{\circ} > 85^{\circ}$ say.....	5 0
Light-red coarse limestone conglomerate; the pebbles are chiefly limestone, with some of quartz of various colours this constitutes <i>Yellow Head</i> or <i>Pointe Jaune</i>	14 0
Red sandstone, with a bed of conglomerate at the bottom two feet thick, with abundance of gray and yellow limestone pebbles, with some of white calcareous spar, various coloured quartz, blood-red jasper, and other silicious kinds; some of the limestone pebbles would weigh about half a pound.....	56 0
Indian-red sandstone, with drab streaks in the elementary layers, which are slightly oblique to the plane of the bed. At the bottom there is a bed of conglomerate with limestone pebbles.....	10 0
Light-brown fine grained strongly calcareous sandstone, with layers of chocolate-red argillaceous shale, with ripple mark and casts of shrinkage cracks in the sandstone, and remains of plants (casts without any carbonaceous coating) in the shale and sandstone; some of them cross the bed obliquely.....	42 0
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	2766 0

3.

Section of Measures exposed in the cliffs reaching from Pointe Jaune to the Trap Dyke at the point between Bréhaut Bay of Baffin's Chart, and the cove to the south of it. The dip varies both in direction and inclination.

Drab sandstones inclining to gray, with partings of reddish-gray shale. The sandstone is composed of quartz and feldspar, but not much mica appears, and it holds a few calcareous pebbles; on the surface of some of the beds appear carbonized remains of plants, a few of them replaced by iron pyrites.....	44	0
Drab sandstone which has something the aspect of a quality fit for grindstones; perhaps it may be too hard.....	64	0
Drab and red sandstones, with some few scattered pebbles.....	124	0
Drab and red sandstone, with some few scattered pebbles consisting of white and green quartz, blood-red jasper, and some of limestone.....	52	0
Drab and red sandstone.....	33	0
Drab and red sandstone, slightly calcareous, with some few scattered white quartz pebbles.....	90	0
Drab sandstone with some red in it. It is micaceous and holds balls of shale.....	15	0
Measures concealed being covered over with red earth and clay. This is in the bight of <i>Chien Blanc</i> cove.....	80	0
Drab and red sandstone with a few darker red streaks.....	57	0
Red shale with a few thin bands of drab sandstone.....	22	0
Drab and red sandstone, more drab than red, the colours running in the elementary layers of the bed, which are slightly oblique. There are four small beds of red shale interstratified.....	34	0
Drab and red sandstone chiefly drab.....	48	0
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	663	0
Red sandstone with green stripes, slightly calcareous.....	21	0
Red sandstone with green stripes.....	94	0
Red sandstone with drab stripes.....	58	0
Red and drab sandstone chiefly red.....	24	0
Pale-red and gray sandstone.....	1	0
Red sandstone and shale.....	11	0

Measures not very well seen. The upper part, say one half, probably consists of drab and red sandstone, the lower half is red shale.....	55	0
Drab and pale-red sandstone, with red and green shale partings.....	63	0
Drab sandstone inclining to green, with red shale beds.....	66	0
Drab and red sandstone with some bands of conglomerate.....	29	0
Green and red sandstone.....	11	0
Greenish coarse pebblish sandstone.....	2	0
Red sandstone.....	18	0
Red shale and palish-red sandstone.....	41	0
Red sandstone, a strong bed.....	3	0
Red sandstone and red shale.....	19	0
Red sandstone and red shale with plants some of which cross the beds; they are not coated with coal.....	54	0
Red sandstone and red-shale; some of the beds have root-like impressions crossing them.....	25	0
Red sandstone a strong bed.....	23	0
Red sandstone and red shale.....	12	0
Red shale and red sandstone.....	7	0
Green and red sandstone with red shale below.....	10	0
Red and green sandstone with shale partings.....	8	0
Red sandstone conglomerate bed.....	7	0
Red and green sandstone with shale partings, a bed of conglomerate at the bottom with pebbles of quartz, jasper and limestone.....	6	0
Green and red sandstone and red and green shale..	7	0
Red and green sandstone and red shale.....	1	0
Red shale and sandstone.....	3	0
Red and green sandstone with shale balls and fragments.....	7	0
Red and green sandstone.....	5	0
Red shale and sandstone, more sandstone than shale, with a conglomerate bed in the middle, having limestone pebbles among others.....	11	0
Red sandstone.....	16	0
Red sandstone and some red shale.....	9	0
Red and green sandstone and red shale. The red sandstone is micaceous and coarse at the bottom	30	0
Red and green sandstone and shale, of a coarse grit at the bottom.....	3	0
Red shale with thin bands of green and red sandstone.....	9	0
Green sandstone.....	3	0

Red shale and red and green sandstone, more red than green in the sandstone,.....	3	0
Red shale and red and green sandstone; at the bottom is a band of conglomerate about a foot thick, with pebbles of limestone, quartz, blood-red jasper and lydian stone,.....	17	0
Red shale and green sandstone,.....	17	0
Red sandstone and red shale,.....	4	0
Red shale and green sandstone, with ripple mark and casts of shrinkage cracks,.....	6	0
Green sandstone and red shale; the sandstone is most abundant towards the bottom, and exhibits very beautiful ripple mark, and casts of shrinking cracks,.....	48	0
Green sandstone,.....	5	0
Green sandstone and red shale,.....	18	0
Green sandstone and red shale in alternate beds of one to two feet; casts of shrinkage cracks occur,.....	11	0
Green sandstone and red shale,.....	14	0
Green shale and green sandstone with iron pyrites disseminated in aggregated cubic crystals; casts of shrinkage cracks occur; they are highly relieved and the pannels they surround are each slightly raised or swelled towards the centre.....	22	0
Green sandstone,.....	2	0
Red argillaceous shale with green spots and streaks and red sandstone,.....	31	0
Red and green sandstone and shale, with casts of shrinkage cracks,.....	31	0
Red and green shale and sandstone,.....	9	0
Red and green sandstone and shale, with highly relieved casts of shrinkage cracks,.....	18	0
Red and green sandstone and shale, with fragments of shale imbedded in the sandstone; the lines of colour often run in the elementary layers of the sandstone, which are occasionally oblique to the bed,.....	9	0
Red and green sandstone, some of the green inclining to drab, with red shale dividing the beds; some of the beds exhibit raised casts of shrinkage cracks of which some are very delicate and fine lined,.....	29	0
Red and green sandstone and shale, in alternate layers of six inches to one foot. The sandstone predominates,.....	7	0

Red and green sandstone and shale in alternate thin layers,	9	0
Green and red sandstone, with a few bands of red argillaceous shale; some of the surfaces exhibit beautiful instances of raised casts of shrinkage cracks, and one a tessellated surface, in which the lines of division are green and rather depressed. The other parts of the surface are red, but the red colour does not sink deep. The interior is green and the compartments are each slightly swelled in the centre,.....	8	0
Red and green sandstone,.....	7	0
Red argillaceous shale and red sandstone,.....	8	0
Green and red calcareous sandstone,.....	4	0
Indian-red sandstone with red argillaceous shale at the bottom,.....	10	0
Indian-red sandstone, green at the top, and green streaks at the bottom, with raised crack casts on the under surfaces next the shale; the sandstone is slightly calcareous,.....	6	0
Red argillaceous shale, with some thin bands of green and red sandstone which are slightly calcareous,	2	0
Red and green slightly calcareous sandstone, with a few beds of red argillaceous shale; some of the sandstone beds have red shale pebbles enclosed in them, and on the bottom of one bed are raised casts of shrinkage cracks. The sandstone is of a moderately fine grit; quartz and feldspar are visible, but not mica.....	16	0
Red argillaceous shale with a few green spots; a thin bed of red and green sandstone lies towards the bottom, the green prevailing. It has ripple mark: some small gray shale pebbles are enclosed in the lower part. The sandstone is slightly calcareous.....	8	0
		1151 0
Coarse conglomerate; the matrix is a sandstone, inclining to red; the pebbles consist of yellow, green, and reddish jasper, and jasper porphyry	29	0
Strong drab pebbly sandstone, inclining to red, with some calcareous pebbles amongst the rest.....	58	0
Strong drab pebbly sandstone; among the pebbles are some large calcareous nodules like septaria	28	0
Coarse conglomerate with pebbles of quartz, jasper, porphyry and some of limestone; the matrix is generally silicious sand, but there are con-		

siderable patches of it, which consist of white crystallized calcareous spar. Some of the pebbles would weigh three pounds, and there are some shale balls in the rock.....	13	0
Drab pebbly sandstone of a durable quality.....	23	0
Drab pebbly sandstone of the same kind with a bed of arenaceous limestone, at the top two feet thick. (Here occurs <i>Bois Brulé Brook</i> , as laid down in Bayfield's chart of Gaspé and Mal Isles).....	89	0
Drab pebbly sandstone, of a durable quality.....	96	0
Coarse conglomerate, composed of red, green, and yellow jasper, white quartz, and black hornstone pebbles, in a matrix of drab sandstone....	27	0
Drab pebbly sandstone, with a bed of conglomerate at the top.....	74	0
Drab pebbly sandstone.....	222	0
Coarse conglomerate, as before, with some slaty fine-grained beds, interstratified at the top, the surfaces of which are covered with carbonized comminuted plants.....	33	0
Coarse conglomerate, composed of red, and yellow jasper, white quartz, yellow feldspar and other pebbles, among which is one of a conglomerate character consisting chiefly of white quartz pebbles.....	156	0
Coarse conglomerate, as before. This constitutes <i>Bois Brulé Head</i>	8	0
	----- 856 0	
Drab sandstone, of a strong durable quality.....	117	0
Green argillo-arenaceous shale.....	16	0
Drab sandstone.....	29	0
Claret-red and green shale.....	22	0
Drab sandstone, with a few pebbles. The under surface of this sandstone is very peculiarly marked, there being a number of deep holes in it, half surrounded by a raised rim, opposite to which there flow out a number of twisted rope-like impressions, converging to a point, to which point the holes or pits gradually shallow. These converging or conical tails are all one way, and the surface has much the appearance of a mould, resulting from the application of the sand, when in a soft condition, to a form occasioned by the rapid flow of water, over impeding lumps projecting from the bottom on which it moved.....	95	0

Claret-red and green argillo-arenaceous shale,.....	34	0
Drab pebbly sandstone, of a strong durable quality	34	0
Gray argillaceous shale, with a bed of sandstone...	17	0
Drab pebbly sandstone, of a strong durable quality,	27	0
Claret-red, green, and dark gray argillaceous shale,	51	0
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	442	0
Drab pebbly sandstone; the pebbles not numerous,	63	0
Drab pebbly sandstone, inclining to greenish, with shale partings and nodules of shale. At the top there is a shale parting, with two large lumps of shale protruding into the sandstone...	133	0
Drab sandstone, with spherical masses of a harder quality enclosed in it.	74	0
Drab sandstone of a slaty character; at the top much of the mass exhibits a conchoidal surface in the fracture. There is probably a considerable quantity of argillaceous mixture with the sand.....	35	0
Drab sandstone, inclining to greenish, with an argillaceous shale bed at the top.....	21	0
Drab sandstone, inclining to greenish, with scattered pebbles and some clay balls.....	141	0
Drab sandstone, inclining to greenish, with a bed of gray argillaceous shale at the top.....	29	0
Drab sandstone, inclining to greenish, with scattered pebbles, shale balls, and spherical masses of a harder quality than the general mass.....	16	0
Drab sandstone inclining to greenish, with shale partings between the beds; argillaceous nodules occur.....	42	0
Drab sandstone, inclining to greenish. There are some small cracks filled with a greener material than the rock, but exhibiting no other difference in quality; accompanying the cracks are minute dislocations. The brook, in the bight of <i>Sailor's Cove</i> , falls over the perpendicular face of the rock, and just under the cascade, the rock swells out a little from the general course of the cliff, as if it were of harder quality than the rest...	31	0
Drab coloured sandstone, inclining to greenish, with a bed of gray shale at the top.....	152	0
Drab sandstone, inclining to greenish, with a bed of gray shale at the top.....	162	0
Drab sandstone, with an irregular bed of shale at the top.....	89	0
Drab sandstone, with a bed of shale of three feet at the top.....	267	0

Drab sandstone.....	230	0
Drab sandstone, alternating with shale for nine feet at the top.....	126	0
Drab sandstone, with ferruginous stains; pebbly beds exist in the bottom part.....	144	0
Measures not well seen, supposed to be shale.....	11	0
Drab sandstone.....	45	0
Drab sandstone, with some scattered pebbles; carbonised comminuted plants are more or less seen on the surfaces of almost every divisional plane	61	0
Drab sandstone, with a very few thin shale partings; there is a very irregular one at the top with great lumps of an argillaceous quality protruding into the sandstone above; some of these lumps are three feet high and as many broad.	180	0
	----- 2052 0	
Drab sandstone, with ferruginous stains, <i>clay ironstone</i> nodules exist at the bottom	30	0
Drab shaly even bedded sandstone, with alternate beds of argillaceous shale at the top.....	7	0
Drab sandstone, with ferruginous stains and hard spherical masses. There is a thin shale bed at the top.....	16	0
Drab sandstone, with an argillaceous parting at the top.....	15	0
Drab sandstone, with some scattered white quartz pebbles and a few <i>clay ironstone</i> balls at the bottom, a red argillaceous shale parting at the top.....	15	0
Dark-gray argillo-arenaceous shale, with some nodules of <i>clay ironstone</i>	4	0
Drab sandstone, inclining to greenish at the top, with hard spherical masses displayed in it.....	30	0
Drab sandstone, with some pebbles and ferruginous stains.....	12	0
Drab sandstone, with some pebbly beds, and at the top a layer of argillo-arenaceous shale.....	36	0
Drab sandstone inclining to red, with disseminated nodules of <i>clay ironstone</i> particularly near the bottom.....	4	0
Claret-red and green and dark-gray argillo-arenaceous shale, with two layers of tough gray <i>fire-clay-looking</i> rock about one foot thick each, which are both crossed by root-like fibrous impressions, some of which bifurcate downward. These two beds are very even and regular for a considerable distance.....	13	0

Drab sandstone inclining to a reddish at the top,...	61	0
Drab sandstone, with some scattered pebbles,.....	18	0
Drab sandstone, with some patches in it inclining to red. There is an irregular bed of gray shale on the top,.....	16	0
Drab sandstone, very slightly inclining to red with an argillaceous parting at the top,.....	21	0
Drab sandstone, inclining to a pale-red or pink (something like the color of common red blotting paper) with large hard spherical masses in it. Ferruginous stains prevail, and there is an argillaceous parting at the top,.....	91	0
Claret-red and dark-gray and green argillaceous shale, with eight beds of a foot each at pretty regular intervals of four feet, which consist of a tough argillo-arenaceous rock very like fire-clay, and are penetrated at right angles to their surfaces by a multitude of slender impressions resembling roots, some of which bifurcate downwards.....	39	0
		428 0
Drab sandstone, inclining to red.....	140	0
Drab sandstone,.....	39	0
Drab sandstone, with an argillaceous parting.....	11	0
Drab sandstone, with some large irregular lumps of argillaceous quality three feet in diameter.....	11	0
Drab sandstone, with a shale parting at the top.....	74	0
Drab sandstone, with hard spherical masses and disseminated nodules of <i>ironstone</i> ; a bed of argillo-arenaceous shale rests on the top.....	133	0
Drab sandstone, with a pebbly bed at the top,.....	13	0
Drab sandstone, inclining to pale-red, with some pebbly beds at the top.....	30	0
Drab sandstone, inclining to pale-red.....	42	0
Drab sandstone	12	0
Drab sandstone and shale in alternating beds.....	11	0
Drab sandstone, with a few scattered pebbles; hard spherical masses exist in the beds, and the divisional surfaces are sprinkled with carbonised remains of comminuted plants.....	58	0
Drab sandstone, with a shale bed at the top.....	45	0
Drab sandstone, with a shale bed at the top.....	8	0
Drab sandstone, with a bed of arenaceous shale at the top.....	42	0
Drab sandstone, with some scattered white quartz pebbles.....	50	0

Drab sandstone, with ferruginous stains; a bed of shale on the top.....	6 0
Drab sandstone, with ferruginous stains, hard spherical masses, and at the top a bed of shaly sandstone, with <i>ironstone</i> nodules, and carbonised comminuted remains of plants	20 0
Measures not seen, being covered with shingle, but supposed to be sandstone.....	57 0
Drab sandstone, with a very few scattered pebbles, and having a bed of shale at the top, and another in the middle. The sandstone weathers rusty-red, bright orange, and ochre. In the general colours of the mass, there is in some parts a tendency to a pale-red and carbonised comminuted remains of plants are displayed in the planes of division.....	64 0
Drab sandstone, with some few scattered pebbles and some iron-stained streaks; a few <i>clay ironstone</i> nodules exist in the beds.....	50 0

 916 0

Measures not well seen, being covered over by sand and gravel in horizontal layers. The measures are probably soft and a brook flows in a valley in the strike of them,.....	102 0
Drab sandstone,.....	1 0
Gray arenaceous shale,.....	9 0
Dark gray argillaceous shale, with a band of <i>argillaceous iron ore</i> three inches thick at the bottom,.....	7 0
Dark gray argillaceous shale,.....	7 0
Gray arenaceous shale,..	7 0
Dark gray argillaceous shale.....	2 0
Gray arenaceous shale inclining to sandstone at the top, and argillaceous shale at the bottom,.....	4 0
Dark gray argillaceous shale,.....	26 0
Greenish arenaceous shale, inclining to sandstone, with a band of argillaceous shale in the middle; carbonised comminuted remains of plants are seen on the divisional planes,.....	4 0
Gray argillaceous shale.....	11 0
Gray arenaceous shale.....	2 0
Greenish argillaceous shale, with two bands of arenaceous shale, having carbonised comminuted remains of plants on the surfaces of the beds,.....	34 0
Gray argillaceous shale.....	7 0

Greenish-gray sandstone, consisting of quartz and feldspar grains, with little or no mica. Hard spherical masses exist in the rock, with a rusty-stained exterior, looking very like rusty cannon balls planted in the face of the cliff. Irregular patches, pieces, and balls of an argillaceous quality, are seen at intervals, with a very few scattered white quartz pebbles; and carbonised comminuted remains of plants are powdered on some of the divisional surfaces.....	75	0
Gray argillaceous, shale with a bed of red argillaceous shale ten inches thick on the top.....	2	0
Gray arenaceous shale.....	1	0
Gray and red argillaceous shale, with a band of arenaceous shale, in the middle.....	4	0
Gray argillaceous shale with a bed of nodules at the bottom which have scarcely enough of iron in them to deserve the name of <i>ironstone</i>	4	0
Gray argillaceous shale.....	8	0
Gray shaly sandstone, with bands of argillaceous shale in the middle, and arenaceous and argillaceous shale at the bottom. Carbonised comminuted remains of plants powder the surfaces of the beds,.....	20	0
Gray arenaceous shale, with a few bands of sandstone; near the top is a bed of very rusty iron-brown colour.....	24	0
Gray arenaceous shale, with a bed of hard gray sandstone at the top, with fucoids and ripple mark.....	9	0
Gray hard sandstone, weathering of a rusty brown, with a bed of argillo-arenaceous shale, having ripple-mark on it.....	10	0
Gray arenaceous shale. In the middle is a hard tough gray bed looking like fire-clay, with fibrous impressions penetrating it at right angles to the plane of the bed.....	8	0
Gray hard sandstone weathering into a rusty colour with fucoids running through it.....	4	0
Gray argillo-arenaceous shale, with one or two small hard rusty bands.....	11	0
Gray hard rusty-weathering bed with fucoids.....	4	0
Gray hard rusty-weathering bed with fucoids.....	15	0
Gray arenaceous and argillaceous, shale with a fucoid bed at the bottom.....	10	0
Gray arenaceous shale, with ripple-mark, and at the bottom a fucoid bed.....	14	0

Gray arenaceous shale, with a furoid bed at the bottom.....	3	0	
Gray arenaceous shale, with a furoid bed below.....	10	0	
Gray arenaceous shale, being nearly all furoid beds	11	0	
Gray arenaceous shale.....	3	0	
Gray arenaceous shale, being a furoid bed.....	4	0	
Gray hard rusty-weathering shaly sandstone, with ripple-mark on every surface, and carbonised comminuted remains of plants.....	7	0	
Gray arenaceous shale, with fucoids and a layer of sandstone on the top.....	12	0	
Gray sandstone and arenaceous shale, with carbonised impressions of broken plants powdering the surfaces of the sandstone.....	20	0	
Drab fine-grained sandstone.....	0	8	
Gray argillaceous shale.....	1	3	
Drab fine-grained sandstone.....	1	3	
Gray argillo-arenaceous shale.....	0	8	
Coal, a regular seam.....	0	$\frac{1}{2}$	
Carbonaceous shale.....	2	$\frac{1}{2}$	
	—	0	3
Gray argillaceous shale, in such a state of decay, being reduced to soft clay, that vegetable remains, if any exist, cannot be distinguished.....	1	6	
Greenish-gray sandstone.....	2	0	
Gray argillaceous shale.....	0	9	
Greenish-gray sandstone.....	0	8	
Red and green argillaceous shale.....	1	6	
Gray argillaceous shale, with fucoids, beneath which is a surface of sandstone, with ripple-mark	1	6	
		—	12 0
			528 0
			7036 0

4.

Section of Measures exposed in the cliffs between Douglstown and Seal Cove, (Bréhaut Bay, as marked on Bayfield's Map,) commencing at the point of rock which bounds the cove on the north, and proceeding northward in descending order. The dip varies, both in direction and inclination, from $70^\circ < 16^\circ$ to $50^\circ < 23^\circ$ to 30° .

Greenish-gray, or drab sandstone, penetrated by vertical root-like impressions in abundance..... 6 0

Greenish-gray, or drab sandstone, with some arenaceous shale of the same colour interstratified with it. The fracture of the sandstone is at right angles to the beds, and parallel to the face of the cliff. The cliff it forms is quite vertical. Some parts of the sandstone give a concoidal fracture under the hammer, to which it yields with difficulty, being tough and hard. Yet it is doubtful whether it would make a building stone, as it appears to crumble away under the influence of the weather, on the beach, where the fragments recently fallen present very splintery forms. Quartz, feldspar, and mica constitute the elements of the rock, and it encloses occasional small crystals of calcareous spar. The beds are by no means thin, and both those of the sandstone and the arenaceous shale are separated by thin laminæ of very argillaceous material, and the surfaces of these laminæ occasionally exhibit what must originally have been shrinkage cracks.....	21	0
Greenish-gray or drab sandstone, containing calcareous nodules of a gray colour, some of which are six to eight inches in diameter and even larger.....	2	0
Greenish-gray or drab sandstone of a crumbly quality, interstratified with beds of arenaceous shale, with thin laminæ of fine argillaceous shale as before,.....	39	0
Greenish-gray or drab pebbly sandstone; the pebbles consist of quartz feldspar and jasper of various colours, but they are not sufficient to constitute a conglomerate,.....	233	0
Greenish-gray or drab pebbly sandstone, with a bed of conglomerate towards the bottom which in addition to the description of pebbles above mentioned, has some of a calcareous quality and some of a green argillaceous shale,.....	40	0
Greenish-gray or drab sandstone, having at the top a strong bed of conglomerate, which with the usual quartz feldspar and jasper pebbles has many sandstone pebbles and fragments of a rather finer grit than that of the rock, and certainly much finer than the matrix of the conglomerate. The sandstone of the bed is much discoloured, being in many parts of an inky hue,	12	0

Greenish-gray sandstone, containing a multitude of large argillo-calcareous nodules and large spherical masses of an arenaceous quality, and of a harder nature than the enclosing rock; some of the former are eighteen inches in diameter, and of the latter not much less,.....	2	0
Greenish-gray, or drab coloured pebbly sandstone...	14	0
Greenish-gray, or drab coloured pebbly sandstone; some of the pebbles are argillaceous.....	16	0
Greenish-gray or drab coloured pebbly sandstone..	36	0
Greenish-gray or drab coloured pebbly sandstone, with some spherical arenaceous masses, with an inky exterior.....	6	0
Greenish-gray or drab coloured pebbly sandstone...	14	0
Greenish-gray or drab coloured pebbly sandstone: the pebbles are of quartz, feldspar, and jasper, and some of the surfaces of the beds present carbonised comminuted remains of plants.....	14	0
Greenish-gray, or drab coloured pebbly sandstone..	28	0
	<hr style="width: 100px; margin-left: auto; margin-right: 0;"/> 483	

RECAPITULATION.

Greenish-gray sandstones and shales, without pebbles, but exhibiting occasional calcareous nodules, and having at the top a bed with vertical root-like impressions.....	68	0
Greenish gray, strong pebbly sandstones, frequently becoming conglomerates, and shewing calcareous nodules and large spherical arenaceous masses.....	415	0
	<hr style="width: 100px; margin-left: auto; margin-right: 0;"/> 483	

5.

Section of Measures exposed in the cliffs going southward from Seal Cove (or Brehaut Bay, as marked in Bayfield's Chart of Gaspé and Mal Bays) commencing near the brook in the centre of the cove. The dip varies in direction and inclination.

Greenish-gray or drab pebbly sandstone; the pebbles consist of quartz, feldspar, jasper &c.....	108	0
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Greenish-gray or drab pebbly sandstone. Carbonized comminuted plants are seen on the surface of some of the beds.....	201	0
Greenish-gray or drab colored pebbly sandstone....	283	0
Greenish gray or drab pebbly sandstone with hard arenaceous spherical masses.....	180	0
Greenish-gray or drab sandstone of a pebbly character; the pebbles frequently so abundant as to form a conglomerate.....	103	0
Greenish-gray or drab pebbly sandstone, with spherical masses of a harder quality, possessed of a blackish exterior.....	23	0
Greenish-gray or drab coloured pebbly sandstone, with many beds of conglomerate; dark red shale balls exist in some beds, yielding to the weather and the beating of the sea, and leaving large holes in the cliff. The conglomerate beds are harder and more resistant to these influences, and the irregularity in the wear of the rock (the dip being at an angle of 60°) produces recesses and arches, and gives the precipice the appearance of a piece of Gothic architecture. There are laminæ of black material dividing beds for short distances. These thin out and cease irregularly. Some flaggy sandstone beds are powdered on the surface, with carbonized comminuted plants, and there are occasional beds of sandstone without pebbles, in which arenaceous spheres occur.....	100	0
Greenish-gray or drab sandstone conglomerate as before. At the bottom of this is an uneven bed of argillaceous shale, dark-gray in colour, filling up the inequalities of the under part of the incumbent sandstone,.....	106	0
Greenish-gray or drab sandstone of a finer grit, with fewer pebbles.....	55	0
Dark-red and green arenaceous shale,.....	22	0
Green and red sandstone in alternate layers,.....	37	0
Green arenaceous shale and claret-red arenaceous shale, the red more argillaceous than the other and below it,.....	10	0
Greenish and drab sandstones of a pebbly quality...	126	0
Red and green argillo-arenaceous shale,.....	18	0
Gray shaly sandstone, greenish and pebbly at the bottom.....	36	0
Red and greenish-gray arenaceous shale,.....	4	0

Gray shaly sandstone, with a band of dark-gray argillaceous shale at the bottom, and a few pebbles in the lower part of it,.....	20	0
Gray sandstone, with carbonised comminuted plants; a few pebbly bands occur and some thin ones of argillaceous shale; pebbles or fragments of shale or clay are occasionally enclosed in the sandstone,.....	106	0
Gray argillaceous shale.....	31	0
Gray sandstone, with much feldspar and no mica; some few spherical masses occur; carbonised comminuted plants are seen and nodules of inferior <i>clay ironstone</i> exist at the bottom,.....	20	0
Gray argillaceous shale with small nodules of <i>argillaceous iron ore</i> ,.....	8	0
Grayish-drab sandstone, with many carbonised comminuted plants. There are one or two thin beds of argillaceous shale and a band of <i>argillaceous iron ore</i> nodules at the bottom,.....	83	0
Drab sandstone, with ripple mark and a band of argillaceous shale at the bottom, having flat nodules of <i>argillaceous iron ore</i> ,.....	14	0
Drab sandstone, with many <i>argillaceous iron ore</i> nodules, and some occasional shale beds. At the bottom of this appears a very even bed of sandstone, with regular parallel grooves or furrows, running diagonally to the dip. They are sharp and angular in the bottom, and the space between each two is flat and even,.....	84	0
Drab sandstone, with arenaceous shale,.....	15	0
Gray sandstone, with reddish iron-stain streaks in the direction of the beds. The stained parts are rather harder than the rest of the rock.....	38	0
Gray shaly sandstone in thin layers, each covered with carbonised comminuted plants,.....	9	0
Light-drab sandstone, with red iron-stain streaks, and carbonised comminuted plants. There are nodules of <i>argillaceous iron ore</i> at the top, and a bed of gray argillaceous shale below,.....	28	0
Gray sandstone, with iron-stain as before, and carbonised comminuted plants,.....	24	0
Gray sandstone, with iron-stain as before, and a band of <i>argillaceous iron ore</i> nodules at the bottom,.....	9	0
Gray sandstone as before, with huge nodules at the bottom, more like arenaceous concretions than iron stone, though there appears to be some iron in them,.....	7	0

Gray sandstone of the same character as the above, with nodules of <i>argillaceous iron ore</i> at the bottom,	103	0
Gray sandstone, with carbonised comminuted plants, and some beds of argillaceous shale,	23	0
Light-drab sandstone, with iron-stain streaks and occasional shale beds, few and far between, with carbonised comminuted plants,	173	0
Light-drab sandstone, as above, with three layers of <i>argillaceous iron ore</i> nodules.....	30	0
Light-drab sandstone, with iron-stained streaks.....	30	0
Light-drab sandstone, in smooth regular beds of various thicknesses, from three inches to two feet, separated by thin beds of arenaceous and argillaceous shale. The sandstone would make good flagging and good building stone, provided it does not receive iron-stain from the action of the weather, of which there is some indica- tion, not however in streaks, but in general colour. On many of the upper surfaces of the beds, indeed on almost every one, there are serpulac- tating impressions deeply grooved into the stone, and marked by transverse furrows, small and parallel, and about a quarter of an inch apart. These are probably worm tracks. Associated with them are a few bivalve shells of the genus <i>atrypa</i> , and there appear to be three, or at least two species.....	22	0
Gray argillaceous shale, with many thin bands of <i>argillaceous iron ore</i> . There are no less than seventy-five of these in the bed, and most of them do not exceed a quarter to half an inch. There are carbonised comminuted plants on the shale, which is more arenaceous towards the top.....	26	0
Light-drab sandstone, with some thin bands of argillaceous shale and disseminated <i>argillaceous iron ore</i> nodules. At the bottom is a bed very much iron-stained, and having irregular brown nodules, or concretions.....	62	0
Light-drab sandstone, with argillaceous shale below	68	0
Leaden-gray argillo-arenaceous shale.....	4	0
Light-drab sandstone, with a bed of argillaceous shale below.....	20	0
Light-drab sandstone, with a bed of argillaceous shale below.....	24	0

Dark-gray argillaceous shale, with a thin band of sandstone, having a very rugose under surface. In the shale above it are five thin bands of <i>argillaceous iron ore</i> , and in that below there are two bands and many disseminated nodules of the same.....	20	0
Light-drab sandstone, with iron-stain streaks, and some nodules of <i>argillaceous iron ore</i> . There is a bed of argillaceous shale at the bottom.....	40	0
Light-drab sandstone, with iron-stain streaks and a bed of argillaceous shale at the bottom.....	44	0
Light-drab sandstone, with iron-stain streaks, and a bed of argillaceous shale at the bottom.....	33	0
Light-drab sandstone, with a thin bed of shale at the bottom.....	29	0
Light-drab sandstone, with a thin bed of shale below	160	0
Light-drab sandstone, with iron-stain streaks, weathering red.....	64	0
Light-drab sandstone, with iron-stain streaks and red-coloured beds. There are a few scattered pebbles in the mass.....	81	0
Light-drab sandstone of the same character.....	29	0
Light-drab sandstone of the same character; ripple-mark at the top, and a bed of argillaceous shale at the bottom.....	23	
Light-drab sandstone of the same character.....	116	0
Light-drab sandstone of the same character.....	63	0
Light-drab sandstone of the same character. It has a bed of a dark brown colour, between burnt-umber and bister, the result apparently of iron-stain. A plant four feet long and two inches wide, with a pellicle of coal on the exterior lay on the bed. But it showed no markings to determine species, being a mere strip, with a slight sinuosity.....	19	0
Light-drab sandstone of the same character, with ripple mark on a surface at the bottom,.....	19	0
Light-drab sandstone of the same character,.....	23	0
Light-drab sandstone, with a few scattered pebbles. Some impressions of <i>fucoides graphica</i> are seen in the lower part of the strata,.....	31	0

6.

Section up a deep narrow ravine on the south side of the Northwest Arm, about three miles above Gaspé, and one mile higher up than the second sandy beach above the Basin. The dip of the measures is 45° < 90° . The strata occasionally hang 10° over the perpendicular.

Red arenaceous shale and red sandstone; the colour is a deep Indian-red or chocolate-red,.....	18	0
Red sandstone of the same tinge,.....	6	0
Greenish gray sandstone,.....	24	0
Red or chocolate coloured shale,.....	1	0
Greenish-gray sandstone, with occasional pebbly beds,.....	600	0
	649	0

7.

Section of the same measures collected lower down, just above the Saw Mill. The dip of the measures is constant in direction, but varies in inclination, being 55° < 41° to 60° .

Deep-red sandstone, presenting ripple mark,.....	20	0
Greenish-gray sandstone,.....	33	0
Greenish-gray sandstone of a coarse grit, with ripple mark, and raised casts of shrinkage cracks on the upper surface,.....	9	0
Greenish-gray sandstone, with a few clay or shale balls, and a few scattered pebbles of dirty pale yellow quartz,.....	9	0
Greenish-grey sandstone, with a few green shale balls or pebbles, with a thin band of red shale in the mass,.....	8	0
Green and reddish crumbly arenaceous bed with a multitude of root-like fibrous impressions; they are very slender, say about a quarter of an inch broad in the direction of the strike, but they are squeezed flat in the direction of the dip. They are coated with a thin shining pellicle of what appears to be argillaceous matter, which is red or green as the impression hap-		

pens to be in the reddish or green part of the rock. The bed is quite full of the impressions, which can be traced in many places one to two feet down in it. They do not radiate, but all penetrate the bed vertically. On the surface of the bed there are about two inches of red clay, a little below which there are laminae with a bright streaky appearance, as if they had been impressed with long thin leaves of some kind,.....	2	0
Greenish-gray sandstone, with green spotty arenaceous shale beds,.....	33	0
Greenish-gray sandstone, with green, spotty arenaceous shale beds; at the bottom of this is a layer of irregular gray calcareous nodules and patches, in which I can detect no organic remains, though the appearance of the bed leads to the expectation of such,.....	11	0
Greenish-gray sandstone of a much more consistent character. The stone is of a coarse grit, but might possibly be fit for grindstones. It has a few scattered pebbles in it, which deteriorate its quality much. They are of green, white, and brown quartz, and are about half an inch in diameter. There are some red and green clay or shale pebbles also,.....	15	0
Greenish-gray sandstones; the pebbles are rather more numerous at the bottom and a little larger: some are curiously worn,.....	11	0
Greenish-gray sandstone of the same quality; some of the pebbles are of a blood-red jasper. At the bottom is a thin bed of conglomerate; one of the pebbles in it is a brownish gray limestone, another is a limestone septarium with a drusy cavity, lined with calcareous spar, weighing a pound. Some are of flesh coloured feldspar, some of black silicious stone, and there are a few large brown argillaceous nodules or boulders weighing three pounds,.....	15	0
Greenish gray sandstone. At the bottom of this is a pebbly bed containing large angular fragments of dark-gray soft argillaceous shale, some of them partly calcareous, with remains of plants. The plants are long slender stalks, which bifurcate, and they are all coated with a thin pellicle of carbonaceous matter; some of the fragments measured eighteen inches by		

twelve, and were two to three inches thick ; some were externally rounded and transversely divided into layers, having a smooth glossy sur- face,	31	0
Greenish-gray sandstone, with some scattered pebbles; the upper part has many small fragments of shale with stalks. The surfaces of some of the beds exhibit carbonised comminuted plants. The species are not distinguishable, but they appear more like grasses than any thing else, ..	20	0
Greenish-gray sandstone, with some silicious peb- bles and fragments of gray shale. At the bottom of this there are considerable patches of what may be called shale breccia. But reddish green and white quartz pebbles are not wanting in the breccia, and some of limestone are present. The bed is in some places twelve inches thick	108	0
Greenish-gray sandstone, with pebbles and shale fragments at the bottom,	6	0
Greenish-gray sandstone with casts of shrink- age cracks on the top, cutting into half an inch of shale	0	3
Greenish-gray sandstone, with casts of shrink- age cracks embossed on it, cutting into half an inch of shale, which separates this from the previous bed. This has casts of shrinkage cracks embossed on the under surface also, associated with a few highly relieved casts apparently of the stems of some plant. They are curved, but possess no distinctive marks	3	0
Reddish and green crumbly sandstone	0	8
Reddish and green crumbly arenaceous shale, ..	0	8
Reddish and green sandstone, with root-like fibrous impressions running vertically across	0	6
Red and green shale	0	3
Reddish and green sandstone, with root-like impressions, as before	1	0
Reddish and green arenaceous bed, with small irregular calcareous nodules. Root-like impressions cross the bed, and belt-like impressions run in it, standing on edge and undulating horizontally, of which the surface is glossy.	0	5

Red and green shale ; the surface of the bed below, is a glossy red, and it is waved by ripple mark.....	1	3	
			— 8 0
Greenish-gray sandstone.....	34	0	
Greenish conglomerate composed of shale or clay pebbles and fragments, with a matrix of green- ish-gray sandstone.....	6	0	
Greenish-gray sandstone, all peppered with pebbles. It can scarcely be called a conglomerate, how- ever, except at the bottom where the pebbles are pretty thick, and consist of black, red, brown, white and green silicious stones, of which some weigh half a pound. Some are of blood-red jasper, and some of limestone.....	42	0	
Greenish-gray sandstone.....	63	0	
Measures not seen, being covered by soil.....	4	0	
Greenish-gray sandstone, with some shale pebbles in the bottom.....	17	0	
Greenish-gray sandstone.....	21	0	
Gray shale breccia with some quartz pebbles, and a matrix of greenish-gray sandstone.....	4	0	
Greenish-gray sandstone.....	8	0	
Light-red shaly sandstone, with green streaks and clouds.....	4	0	
Light-red sandstone, with root-like impressions crossing it.....	2	0	
Light-red shaly sandstone, with green streaks.....	6	0	
Greenish-gray sandstone.....	12	0	
Light-red shaly sandstone, with green streaks.....	23	0	
Light-red arenaceous shale, with green streaks.....	14	0	
Light-red arenaceous shale, with root-like impres- sions, as before.....	4	0	
Light-red crumbly arenaceous shale, with root-like impressions, as before.....	2	0	
Greenish-gray sandstone.....	6	0	
Light-red sandstone, with green streaks.....	12	0	
Greenish-gray sandstone.....	12	0	
Light-red sandstone, with some shaly bands.....	10	0	
Light-red sandstone.....	6	0	
Measures not seen, being concealed by soil, but sup- posed to be red sandstone and shale.....	19	0	
Light-red sandstone, with greenish streaks and clouds.....	4	0	
Light-red tough crumbly arenaceous bed, with a multitude of root-like impressions crossing it..	2	0	
Light-red sandstone of rather a shaly character.....	14	0	

Light-red sandstone, with root-like impressions crossing the lower half.....	4	0
Red sandstone of a deeper colour.....	14	0
Red sandstone and shale, with vertical root-like impressions on the bottom.....	31	0
Deep-red sandstone.....	114	0
Reddish-gray sandstone, with some pebbles in it at the top, becoming sufficiently numerous lower down to give the character of a conglomerate.....	20	0
Reddish-gray, and greenish-gray sandstone, the colours clouded into one another; scattered pebbles exist in.....	31	0
Reddish and greenish-gray sandstone.....	50	0
Reddish and greenish-gray sandstone, with vertical root-like impressions.....	4	0
Reddish and greenish-gray shaly sandstone.....	38	0
Greenish-gray and reddish arenaceous shale, splitting into irregular lumps and penetrated vertically by root-like impressions.....	25	0
Greenish-gray and reddish-gray sandstone.....	21	0
Greenish-gray sandstone, with reddish clouds and streaks, with an occasional bed of a coarse grit containing pebbles.....	45	0
Greenish-gray sandstone, with reddish clouds and streaks, as above.....	16	0
Greenish-gray sandstone, with reddish clouds and streaks; the upper part is a conglomerate, with various coloured silicious pebbles.....	53	0
Greenish-gray sandstone, with fewer reddish clouds and streaks in it.....	42	0
		1198 0

(Here the section is interrupted by a trap-dyke which occurs close by the brook which drives the mill.)

RECAPITULATION.

Deep-red sandstones, with ripple mark.....	20	0
Greenish-gray sandstones of a more or less fine grit, and always of a free texture, with many scattered silicious pebbles of various colours, white, red, green, yellow, gray, and black, with some of blood-red jasper among them, some of feldspar, and a few of limestone. The pebbles occasionally become so numerous as to constitute a conglomerate, in which balls and fragments of		

clay or shale, sometimes with vegetable impressions on them, are often present. The shale fragments occasionally make a breccia. Ripple-mark and casts of shrinkage cracks are met with, and beds containing vertical root-like impressions occur; of these there are two.....	518	0
Red sandstones and shales without pebbles, being at the top of a light colour, with streaks of green, and of a deep red at the bottom; root-like impressions occur, and of these there are four beds.....	315	0
Clouded reddish-gray and greenish-gray sandstones, with scattered pebbles and occasional conglomerate beds. Root-like impressions occur in two beds.....	143	0
Clouded greenish-gray and reddish-gray sandstones, with scattered pebbles and occasional conglomerate beds.....	202	0
	1198	0

8.

Section on the lower side of the trap dyke, between the Saw Mill and the sandy beach, the general dip of the measures being 6.5° < 56°.

Deep-red sandstone.....	50	0
Greenish-gray sandstone of a coarse grit.....	49	0
Greenish-gray sandstone, with some few scattered pebbles.....	14	0
Greenish-gray sandstone, with more pebbles.....	12	0
Greenish-gray sandstone, with many pebbles.....	9	0
Greenish-gray sandstone, with pebbles enough to constitute a conglomerate.....	5	0
Greenish-gray sandstone of a coarse grit, with pebbles.....	14	0
Greenish-gray sandstone, with spots and clouds of reddish, with scattered pebbles and carbonised remains of plants (grasses?) in one or two places.....	14	0
Greenish-gray sandstone, with a few scattered pebbles.....	9	0
Greenish-gray and reddish sandstone of a strong quality.....	12	0

Greenish-gray sandstone of a consistent quality, clouded and streaked with red.....	12	0
Greenish-gray sandstone, with more red streaks and clouds.....	14	0
Greenish-gray sandstone, with fewer red streaks and clouds.....	9	0
Greenish-gray sandstone, with spots and clouds of reddish.....	14	0
Greenish-gray arenaceous beds of a splintery character, not consistent enough for building, and it perhaps should be called an arenaceous shale. There are vertical root-like impressions in the top, some of them carbonised, and there are reddish spots in the bed.....	22	0
Greenish-gray sandstone. The top is of a splintery crumbly character, with root-like vertical impressions. There is little or no mica in the bed.....	14	0
Greenish-gray sandstone.....	7	0
Greenish-gray sandstone, with some fragments of green shale.....	12	0
Greenish-gray sandstone.....	21	0
Greenish-gray sandstone, with a considerable number of scattered silicious pebbles.....	24	0
Greenish-gray sandstone, with pebbles near the top,	9	0
Greenish-gray sandstone, with a very slight reddish cast. The grit is coarse and there are white, red, green, and black silicious pebbles scattered through the mass.....	48	0
	-----	394 0

RECAPITULATION.

Red sandstone.....	50	0
Clouded greenish-gray and reddish sandstones, with scattered pebbles and occasional conglomerates; vertical root-like impressions occur in two beds.....	344	0
	-----	394 0

9.

Section on the North-west side of Gaspé Harbour, from the neighbourhood of the Bluff, across the measures South-westward. The dip is constant in direction, but varies in inclination, being 50° to 56° to 90° .

Deep red sandstones with green patches.....	29	0
Red tough crumbly arenaceous beds, with vertical root-like impressions, and limestone nodules at the bottom. On the face of the bed are some small oval marks, with a small dot in the centre. They appear to be the terminations of calcareous replacements of the vertical fibres, ..	17	0
Red arenaceous shale, with vertical root like fibres; some of the roots are replaced by carbonate of lime. I counted two hundred of these in a square of six inches.....	5	0
Greenish-gray sandstones of a pebbly character....	24	0
Greenish-gray sandstone, with pebbles; some of them are fortification agate, with blood-red jasper, and syenite with red felspar and black hornblende,	18	0
Greenish-gray sandstone; a pebbly bed at the bottom; red, white, greenish and yellow quartz, black hornstone, blood-red jasper, red syenite and gray limestone are among the pebbles.....	26	0
Greenish-gray sandstone of a conglomerate character; with the silicious pebbles are associated some of red gray and green shale.....	39	0
Greenish-gray and red sandstone of a crumbly yet tough quality; a bed with vertical root-like impressions exists at the top.....	8	0
Green and red soft splintery sandstone, or perhaps it should be called arenaceous shale, with a band of red shale at the bottom.....	20	0
Greenish and red shale.....	3	0
Reddish and greenish, tough, splintery sandstone, with a thin band of red shale at the bottom, having calcareous nodules and exhibiting casts of shrinkage cracks on the under-side,	25	0
Greenish and reddish tough splintery sandstone with a bed of red shale at the bottom.....	10	0
Greenish and reddish tough splintery sandstone, of a more shaly character than the preceding.....	12	0
Greenish and reddish tough splintery sandstone, with three bands of shale.....	2	0

Greenish-gray sandstone, of a more consistent quality.....	31	0
Greenish-gray sandstone, with scattered pebbles pretty numerous at the top.....	14	0
Greenish-gray sandstone, with scattered pebbles: this forms the <i>Bluff</i> point turning into Gaspé barbour.....	28	0
Greenish-gray sandstone, with a considerable number of pebbles.....	43	0
Greenish-gray arenaceous shale.....	14	0
Greenish-gray sandstone, with a little shale.....	8	0
Greenish-gray sandstone, with a few pebbly beds; a thin bed of red shale at the bottom.....	47	0
Greenish-gray sandstone.....	45	0
Greenish-gray sandstone, more tough and splintery	26	0
Greenish-gray sandstone of a shaly quality.....	13	0
Greenish-gray sandstone of a more durable quality, with scattered pebbles of various colours. This forms the second point approaching the harbour.....	70	0
Greenish-gray sandstone; when free from pebbles it is probable that the sandstone at this point would in parts be fit for grindstones.....	8	0
Greenish-gray strong arenaceous shale or splintery soft sandstone.....	62	0
Greenish-gray splintery sandstone.....	3	0
Greenish-gray strong arenaceous shale, with a thin band of red shale at the bottom.....	51	0
Greenish-gray strong arenaceous shale.....	5	0
Red and green arenaceo-argillaceous shale.....	5	0
Dark-gray arenaceo-argillaceous shale, (the <i>blue-stone</i> of the Welsh coal miners).....	3	0
Gray tough splintery arenaceous bed, very like fire-clay, with a great abundance of straight vertical root-like impressions.....	5	0
Gray arenaceo-argillaceous shale, with a band of red shale at the top and another at the bottom,	5	0
Gray argillaceous shale.....	3	0
Gray argillo-arenaceous shale.....	2	0
Dark-gray argillaceous shale.....	2	0
Gray tough splintery argillo-arenaceous bed, very like fire-clay, with vertical root-like impressions	3	0
Greenish-gray arenaceous shale,.....	2	0
Gray argillaceous shale,.....	3	0
Gray tough splintery arenaceous shale, with argillaceous shale at the bottom; the whole penetrated by vertical root-like impressions.....	2	0

Greenish-gray arenaceous shale,.....	3	0
Gray argillaceous shale,.....	5	0
Greenish-gray arenaceous shale.....	3	0
Greenish-gray sandstone, with oblique root-like im- pressions penetrating the bottom part,.....	5	0
Gray tough arenaceous bed, with vertical root-like impressions,.....	3	0
Greenish-gray arenaceous shale, with nodular sandy concretions,.....	3	0
Greenish-gray splintery sandstone,.....	28	0
Greenish-gray sandstone, of a more even, consistent and durable quality,	3	0
Greenish-gray splintery sandstone,.....	28	0
Greenish-gray sandstone, with a parting of clay be- low,	5	0
Greenish-gray strong arenaceous shale,.....	8	0
Greenish-gray sandstone, of good, useful quality, with some few scattered pebbles,.....	50	0
Greenish-gray splintery sandstone,.....	47	0
Greenish-gray hard slaty sandstone,.....	2	0
Greenish-gray splintery sandstone,.....	49	0
Greenish-gray arenaceous and argillaceous shale,...	5	0
Greenish-gray sandstone, pebbly towards the bottom,	76	0
Greenish-gray strong arenaceous shale,.....	8	0
Greenish-gray sandstone,.....	8	0
Greenish-gray strong arenaceous shale,.....	5	0
Greenish-gray sandstone, with some scattered pebbles,.....	149	0
Measures not well seen, been covered by debacle,...	46	0
Greenish-gray sandstone, with some pebbly beds...	80	0
Measures not well seen, being covered with soil,...	31	0
Measures not perfectly seen, but supposed to be shaly	20	0
Greenish-gray sandstone, with some pebbly beds...	200	0
Measures not seen, being covered up by the herbage and soil of a valley,.....	54	0
Measures not seen, the face of the bank being covered by sand,	270	0
Measures not perfectly seen, the upper part suppo- sed to be sandstone,.....	54	0
Measures not seen, being covered up by trees and soil in the bank and mud on the shore,.....	826	0
Greenish-gray sandstone,.....	18	0
Measures not seen, being covered up by mud and soil,	80	0
Greenish-gray sandstone,.....	80	0
Dark-green argillo-arenaceous shale,.....	13	0
Measures not seen perfectly, but supposed to be shale	53	0
Greenish-gray sandstone,.....	10	0

Measures not seen, being covered up by trees and soil,	189	0
Greenish-gray sandstone,.....	3	0
Measures not seen, covered by soil and herbage....	300	0
Greenish-gray sandstone,.....	27	0
Measures not seen, covered by soil and herbage,....	44	0
Greenish-gray sandstone,.....	5	0
Measures not seen,.....	5	0
Greenish-gray sandstone,.....	22	0
Greenish-gray arenaceous shale, with vertical root- like impressions,.....	6	0
Greenish-gray sandstone,.....	204	0
Measures not seen, being covered by soil and herbage	189	0
Greenish-gray sandstone,.....	8	0
Measures not seen, being covered by soil and herbage	69	0
Greenish-gray sandstone,.....	193	0
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	4333	0

