REPORT

BY

MR. JAMES RICHARDSON,

ADDRESSED TO

ALFRED R. C. SELWYN, ESQ.,

DIRECTOR OF THE GEOLOGICAL SURVEY OF CANADA.

SIR,—In the month of May last I was instructed by Sir W. E. Logan to make a geological examination of the north shore of the lower St. Lawrence from the River Saguenay to the Bay of Seven Islands, a distance of about 220 miles; I was also directed to ascend one or more of the principal rivers on the coast.. Those selected were the Manicouagan and Bersimis; the former was surveyed for about forty miles up, while the latter, which had already been surveyed by Admiral Bayfield, was ascended for a distance of thirty miles. A map of the area examined has been constructed on a scale of four miles to one inch, on which the geological facts and other characteristics of the country are laid down. North shore of St. Lawrence.

Having completed my survey of the north shore, about the middle of September, I returned to Montreal, and was then ordered to proceed to Trois Pistoles, on the south shore of the St. Lawrence, and continue to the north-eastward my work of 1868, which had terminated at that point, and was resumed and carried along the coast as far as Father Point, a distance of about forty miles. Examinations were also made along several transverse lines of from four to ten miles, in a south-east direction; more facts are, however, wanting before my results in this district can be given in a complete form. South shore.

On the north shore the geological formations of the area examined are:

1. Laurentian gneiss.
2. Labradorite rocks.

The Laurentian gneiss sometimes has little appearance of stratification; the strike is generally nearly north and south, with dips often approaching vertical. The strata are all more or less broken, contorted and faulted. Laurentian gneiss.

The labradorite rocks rest unconformably on the Laurentian; they generally strike nearly east and west, and dip at comparatively moderate angles, with little or no appearance of contortion or disturbance.

The Laurentian rocks consist chiefly of coarser and finer reddish and greyish gneiss, often syenitic, and marked by dark bands holding much hornblende or mica. A coarsely granitoid reddish syenitic gneiss was observed at the following localities, viz :—Ten miles up the Bersimis ; on the Outarde River from the tide-way, for a distance of five miles ; and on the coast a little east of the Papinachois.

At Escoumains a fine white granitoid gneiss occurs, composed of pure white feldspar and quartz, with, rarely, small grains of black hornblende, In the neighbourhood of Point de Monts and Trinity Bay, considerable masses of a fine gray diorite, which appears to be intrusive, are found among the gneisses, and numerous dykes of black fine-grained trap are also met with in the vicinity.

Intrusive diorites.

On the coast, two miles east of the Papinachois ; on the north side of the Government Road, about a mile east of the Great Bergeron Cove ; and about sixteen miles up the Manicouagan River, at the foot of the seventh portage, vitreous quartz rock occurs in masses of from 50 to 120 feet in thickness. Some of this rock is very pure, and might be used for glass-making; but much of it holds sparingly disseminated plates of flesh-red feldspar, and a pale green steatitic mineral. About twelve miles up the river last named, there occurs in the gneiss a bed, twelve feet thick, of coarsely crystalline limestone, gray, yellowish, and occasionally pinkish in colour, and holding grains of green pyroxene ; this, with the exception of a thin seam of dolomite found at Lobster Bay, is the only Laurentian limestone observed during the season.

Crystaline limestone.

Labradorite rocks.

The labradorite rocks along the coast examined offer many varieties in character and aspect, but are generally bluish or greenish in colour, much resembling those found to the north of Montreal; in one case beds were met with holding considerable quantities of red garnets in lumps up to half an inch in diameter. Some of the beds contain much black mica, and others nodules of a gray fibrous hornblende approaching actinolite ; varieties of the labradorite rock were also met with holding hypersthene, and small masses or layers of magnetic iron ore.

The first locality to be noticed, where these rocks occur, is at the mouth of Pentecost River, and for about half a mile to the north-eastward. The rock is here banded with coarser and finer varieties, holding small lumps of red garnet, mica, actinolite and iron ore, which make its stratification very apparent ; it dips with much regularity N. 23° E. $\angle$ 30° to 40°, as may be seen for half a mile along the shore; which here trends nearly north and south, in a succession of low bluffs, seldom above thirty feet in height.

In Lobster Bay, half a mile further to the eastward, after an interval of concealment, the reddish quartzose granitoid rock of the Laurentian is again met with, offering no evidence of stratification; and in one place is seen to be distinctly overlaid by a patch, only a few yards square, of labradorite-rock, shewing considerable varieties in character, and clearly stratified, with a strike N. 53° E. Labradorites.

Labradorites are the only rocks seen from the May Islands to Point St. Margaret, and also at the falls of the river of that name, the interval being concealed by sand. Rocks of the same series were observed by Dr. Hunt at the head of the Bay of Seven Islands, enclosing a large mass of titanic iron ore, and they form also the great southern promontory of the bay, where the rock is generally more or less coarse-grained, greenish-blue in colour, and holds hypersthene and titanic iron ore. The dip of the beds of labradorite-rock, as seen here along a distance of three or four miles, is generally uniform to the north, at angles of from 10° to 20°. At the falls of the St. Margaret the dip is N. 28° E. $<$ 22°, while at Point St. Margaret it is S. 32° E. $<$ 82°.

Both the Laurentian gneiss and the labradorites are cut by granitic veins, sometimes of considerable width, made up of large crystalline masses of deep red orthoclase, often with a pale green feldspar, probably oligoclase, black crystalline hornblende, vitreous quartz, and sometimes crystalline masses of magnetic iron ore. Granite veins.

Besides the above crystalline rocks, a small patch of Silurian limestone occurs on the east side of Manowin, one of the group of the Seven Islands. The beds of this light-coloured fossiliferous Silurian limestone are seen to repose on reddish gneiss, and dip northward at an angle of from 2° to 6°; The fossils, according to Mr. Billings, shew it to belong to the Trenton group; it has been quarried for use at the Moisie iron-works, near by. Silurian limestones.

In addition to the economic materials already mentioned, the iron sands of this region, which have attracted considerable attention, may be noticed. The deposits of these sands at Moisie have been examined by Dr. Hunt, who has shewn that they belong to the stratified silicious sands of the district, which here overlie the old marine clays, at considerable heights above the present sea level. In many places I observed beds holding so much iron ore as to shew dark or nearly black layers among the gray and brown silicious sands. They were seen, of this character, at various places along the coast, at heights up to 100 and even 200 feet above tide-level; while on the Manicouagan River, twenty-four miles from its mouth, where it attains a height of 256 feet above the sea, the banks of sand exhibited the same dark-coloured bands of iron sand, from forty to fifty feet above the water. Iron sands.

On the coast between Portneuf and Sault au Cochon, and also between

the River St. Margaret and the Bay of Seven Islands, hills of post-tertiary clays, containing marine fossils, and attaining heights of from 50 to 150 feet, are often seen to be capped with from forty to fifty feet of similar fine and coarse brown sand, banded with dark layers likewise charged with black iron ore.

Iron sands.

The rich accumulations of ore which are seen along the beach appear, as Dr. Hunt has remarked, to result from a natural process of concentration by the action of the water upon these sands; they were observed in a great many places on the coast, about high-water mark, in strips from three to nine and twelve feet wide, and from two inches to two feet in thickness, often extending without interruption, for miles. It is said that the visible extent and the richness of these local deposits is somewhat affected by the varying action of the wind and water. The places at which I noticed these belts of iron sand along the portion of coast examined are as follows, viz:—

1. The vicinity of Tadousac, for a distance of three miles downwards.
2. From Jeremie to Bersimis, and thence to the Papinachois, a distance of twelve miles.
3. The peninsula at the mouths of the Outarde and Manicouagan rivers, for thirty miles.
4. From English Point to Pentecost River, for eight miles.
5. The coast on both sides of the St. Margaret River for ten miles; making in all sixty-six miles.

In all these places except the first named, near Tadousac, I think that the quantity of ore is such that it might be collected with profit, especially by the aid of proper concentrating machinery. Water-power, if needed, is accessible in several localities near the iron sands; among others, at the falls of the River Baude, on the coast, three miles below Tadousac; at the falls of the Papinachois, also on the coast; at those of the Outarde and Manicouagan, at the head of tide-water (respectively twelve and fifteen miles from the general trend of coast): at a fall in a stream, on the coast, half a mile north-east of Pentecost River; and at the falls of the St. Margaret, three miles from the coast.

The mouths of the Bersimis, Papinachois, Outarde, Manicouagan, Pentecost, and St. Margaret, all afford safe harbours, with sandy bottoms, which vessels drawing twelve feet of water may enter at high tide, although the access is somewhat difficult, on account of numerous sand-banks. In any of them a wharf extending from forty to fifty feet from the shore would be sufficient to reach the channel.

Geographical features.

The surface of the whole region examined, with the exceptions mentioned below, is broken and irregular. The hills of hard rock occasionally attain a height of upwards of 2,000 feet, besides which, there are hills of

stratified clays, capped by sand, often rising 200 feet or more ; and in one instance near Tadousac, 400 feet.

A very thin soil occasionally occurs on the rocky hills, but, generally over large tracts where fires have destroyed the vegetation, little remains but a bare surface of solid stone.

Forest trees

On the portion of the coast between the Saguenay and the Outarde, where the soil permits, there is timber of fair size, consisting of yellow pine, spruce, balsam-fir, tamarack and white birch. Yellow pine was formerly cut on the Portneuf River, and considerable qu antities still remain on the rivers Escoumains, Sault au Mouton, Sault au Cochon, Bersimis, and Papinachois. Pine logs, as I saw them at the mills, and in the forest, were from twelve to twenty inches in diameter. Beyond the river Outarde no yellow pine is met with, and from thence to the Seven Islands, the other trees are smaller, and the barren portions are more extended.

Soil.

From Tadousac to the River Baude, a distance of about three miles along the coast, there extends a belt, less than a mile in width, of yellowish-brown sand, mixed with thin layers of the iron sand already noticed. Following the river just named, for about two miles northwardly, the clays gradually come out from beneath the sand, and afford an excellent soil. The Hon. David E. Price, Senator, informed me that this kind of soil stretches northward towards the St. Margaret River, and is of considerable extent; but it is not accessible for want of a road. On the Little Bergeron Cove and River, there is a strip of similar good soil, four or five miles long by about a mile wide, and on the Great Bergeron Cove, there are from 1,000 to 1,500 acres of excellent land, yielding good crops of vegetables, and all kinds of grain.

From the cove last mentioned, to the Escoumains, a plain extends from the shore to a bare ridge of reddish gneiss, from two to seven miles inland, and occupies an area of forty to fifty square miles. The soil of this plain is a coarse brown sand, with patches of moss, probably in depressions, and sustains a growth of blue-berry and other shrubs, with a few stunted spruces, balsam-firs and white birches. Some attempts have here been made at farming, but with very little success, except at a few spots on the coast, just to the west of Cape Bon Desir, where the clay, which underlies this sand, has been uncovered by land-slides.

From the village of Escoumains, at the mouth of the river of that name, to Mille Vaches Bay, a distance of about twenty miles, extends a belt of sand like that just described, and from one to two miles in breadth, with occasional protruding spurs of gneiss rock. Here, as before, the only successful attempts at cultivation are confined to spots where the underlying clay has been exposed by the cause above mentioned.

From Mille Vaches Bay to Sault au Cochon, a distance of twelve miles

Cliffs of clay and sand.

a similar sand plain prevails along the coast, also extending about two miles inland. From the last mentioned point to the Portneuf River, cliffs of clay, capped by sand, rise boldly up from the shore to heights of from 100 to 200 feet. These cliffs, which have already been mentioned in speaking of the iron sands, have in their lower part from fifty to probably one hundred and fifty feet of fine blue clay, in which the fossil remains of the *Mallotus villus*, or capeling, and several species of recent marine shells, were found imbedded. The brown sand, often forty or fifty feet in thickness, which overlies these clays, presents alternate coarse and fine layers, and is banded with others holding black iron sand. Beyond Portneuf to Jeremie, a distance of about fourteen miles, the coast is rocky, and affords only a few isolated patches of sandy soil; but from Jeremie to Point St. Giles, at the mouth of the Manicouagan, a distance of nearly forty miles, there is a recurrence of the sandy plains, with occasional protruding masses of hard gneiss rock.

Along this coast considerable portions of land are covered with moss, as may be seen just to the east of the Indian Village and Hudson Bay Company's post at Bersimis. These sandy tracts include a part of the Bersimis Indian Reserve, together with the peninsula between the mouth of the Outarde and Manicouagan Rivers, and have an extent which may be approximately estimated at 200 square miles. In ascending the Bersimis River for about thirty miles, occasional patches of from 200 to 1,000 acres of sandy soil are met with, lying between rocky ridges.

River Manicouagan.

In ascending the Manicouagan River from a point twenty-four miles from its mouth, to the Forks, fourteen miles further, is a reach of deep water, with a gentle current, between banks from ten to fifty feet high, composed of brown sand, with layers holding the usual black iron ore. The river here, as already mentioned, is 256 feet above the sea, and the valley, which is about a mile in width, is walled in by ridges of gneiss rock, rising above it to heights estimated at from 300 to 1,500 feet, often bare of vegetation. This sandy valley supports in most places a stunted growth of spruce, balsam-fir and white birch, but at the Forks, and for about four miles below, the soil is a loam, and produces a growth chiefly of poplars and white birches, which attain a fair size; one of the latter, which I cut down, was eight inches in diameter at the base, and 102 feet high; its age, judging from the rings of growth, was between sixty and seventy years.

From Point St. Giles to the Godbout River, a distance of twenty-six miles, the coast is mostly rocky and barren, with the exception of about 600 acres of sandy soil at the mouth of the river, surrounded by rocky gneiss hills; thence to English Point, a distance of thirty-five miles, the country is still mostly barren and rocky. From English Point to Pentecost River, about eight miles, another belt of similar sandy soil occurs, with an average width of from one to two miles.

From Pentecost River to Point St. Margaret, twenty-seven miles, it is again barren and rocky—thence to Seven-Island Bay, a distance of twenty-four miles, and also to a few miles beyond the River Moisie, a further distance of thirty miles, a similar, sandy soil occupies a belt of country, varying in width from one to about twelve miles; the whole giving an area of about 500 square miles. In the rear of the belt between Point St. Margaret and the Moisie River, bare rocky hills are seen, having an average height of nearly 1,000 feet.

In the interior, areas not observed, of the same kind of soil, may be met with; but they are probably small in extent and difficult of access. Although these sandy soils are capable of being cultivated, a superior knowledge of their management is required to do so successfully.

I have the honour to be,

Sir,

Your most obedient servant,

JAMES RICHARDSON.

Montreal, 18th April 1870.