CIHM
Microfiche
Series
(Monographs)

ICMH
Collection de
microfiches
(monographies)

Canadian Institute for Historical Microreproductions / Institut canadien de microreproductions historiques

Technical and Bibliographic Notes / Notes techniques et bibliographiques

The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming are checked below.

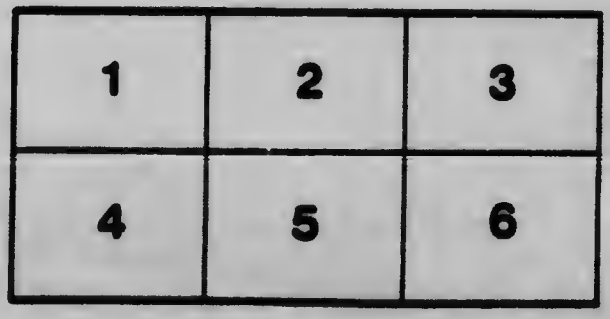
- [x] Coloured covers / Couverture de couleur
- [ ] Covers damaged / Couverture endommagée
- [ ] Covers restored and/or laminated / Couverture restaurée et/ou pelliculée
- [ ] Cover title missing / Le titre de couverture manque
- [ ] Coloured maps / Cartes géographiques en couleur
- [x] Coloured ink (i.e. other than blue or black) / Encre de couleur (i.e. autre que bleue ou noire)
- [ ] Coloured plates and/or illustrations / Planches et/ou illustrations en couleur
- [ ] Bound with other material / Relié avec d'autres documents
- [ ] Only edition available / Seule édition disponible
- [ ] Tight binding may cause shadows or distortion along interior margin / La reliure serrée peut causer de l'ombre ou de la distorsion le long de la marge intérieure.
- [ ] Blank leaves added during restorations may appear within the text. Whenever possible, these have been omitted from filming / Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.
- [x] Additional comments / Commentaires supplémentaires:

L'institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

- [ ] Coloured pages / Pages de couleur
- [ ] Pages damaged / Pages endommagées
- [ ] Pages restored and/or laminated / Pages restaurées et/ou pelliculées
- [x] Pages discoloured, stained or foxed / Pages décolorées, tachetées ou piquées
- [ ] Pages detached / Pages détachées
- [x] Showthrough / Transparence
- [x] Quality of print varies / Qualité inégale de l'impression
- [ ] Includes supplementary material / Comprend du matériel supplémentaire
- [ ] Pages wholly or partially obscured by errata slips, tissues, etc., have been refilmed to ensure the best possible image / Les pages totalement ou partiellement obscurcies par un feuillet d'errata, une pelure, etc., ont été filmées à nouveau de façon à obtenir la meilleure image possible.
- [ ] Opposing pages with varying colouration or discolourations are filmed twice to ensure the best possible image / Les pages s'opposant ayant des colorations variables ou des décolorations sont filmées deux fois afin d'obtenir la meilleure image possible.

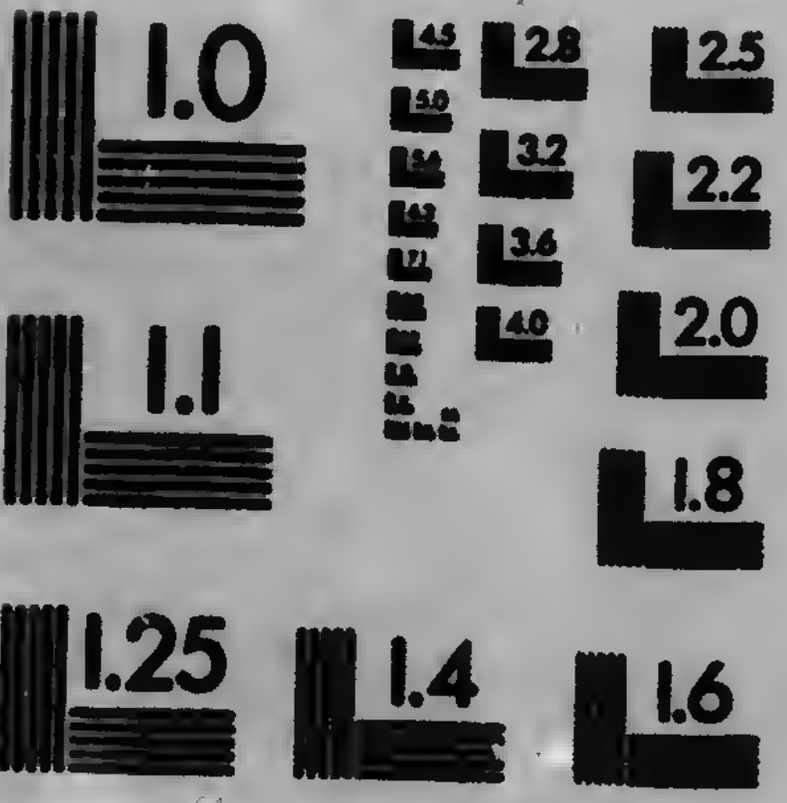
This item is filmed at the reduction ratio checked below / Ce document est filmé au taux de réduction indiqué ci-dessous.

10x	12x	14x	16x	18x	20x	22x	24x	26x	28x	30x	32x
						✓					



MICROCOPY RESOLUTION TEST CHART

(ANSI and ISO TEST CHART No. 2)



APPLIED IMAGE Inc
1653 East Main Street
Rochester, New York 14609 USA
(716) 482 - 0300 - Phone
(716) 288 - 5989 - Fax

Geological Survey of Newfoundland

REPORT
UPON

Exploration and Boring Operations

IN THE

Central Carboniferous Basin near Grand Lake, 1904

By
JAMES P. HOWLEY, F.G.S.

ST. JOHN'S, N.F.
Robinson & Company, Limited, Press
1917.

R. J. Sandor - Sky

REPORT

UPON

The Mineral Statistics of Newfoundland

for the Calendar Year 1904

By

JAMES P. HOWLEY, F.G.S.

ST. JOHN'S, N.F.
Robinson & Company, Limited, Press.
1917

REPORT

ON

The Mineral Statistics of Newfoundland for the Calendar Year 1904.

Geological Survey Office,
St John's, Nfld.,
March 24th, 1905.

HON. J. AUGUSTUS CLIFT, K.C.,

Minister of Agriculture and Mines,—

SIR,—In presenting this my seventh annual report on the mineral statistics of the island, it is gratifying to be in a position to record another substantial increase in the output for the last calendar year. As may be seen by the accompanying tables, the upward tendency pointed out in previous reports, has been fully maintained.

Though the usual delays occurred in getting in the returns, yet, with few exceptions, the persons engaged in the mining industry, have promptly supplied the necessary information, for which I take this opportunity of again thanking them. Owing, however, to the necessity of awaiting the close of the year for the complete returns and to the difficulties of navigation which usually occur after that period, especially northward, it is impossible to compile these reports at an earlier date. I trust, however, though somewhat late, they may not be found without interest, as exhibiting the condition and value of this important branch of the country's industrial pursuits.

It will be observed that although in a few instances there appears to be a falling off, both in the quantity and value of certain commodities, such as Barite, Slate, Granite, Building-stone, &c., this is greatly counter-balanced by the increase in other directions.

According to the figures now in my possession, the total value of the raw materials of last year's output amounted to the handsome sum of $1,353,953.00, being an increase over that of 1903 of $84,148.00. This most satisfactory result has more than fulfilled

the prognostications with regard to the growth of this important industry, as set forth in my former reports, all of which have been amply borne out.

During the first four years of the new century, the mining development has gone on increasing steadily. Thus in 1900 the total value of the mineral production was only $792,099; in 1901 it jumped to $1,202,272; in 1902 it was $1,217,386; in 1903, $1,269,805, and 1904, $1,353,953. Taking the increase from year to year which totals $561,854, it gives an average annual increase of $140,463.50.

The percentages &c., of this increase stand as follows:

TABLE I.

Table Showing Percentage of Increase per capita value of Mineral Products, and Proportionate Earning Power of those Employed in Production, etc.

Year.	Percentage of Increase.	Per Capita Value	Proportionate Earning Power of Persons Employed.
		$ c.	$ c.
1901	51'78 p.c.	5.53	672.86 ?
1902	1'28 p.c.	5.56	676.49 ?
1903	4'28 p.c.	5.75	611.36
1904	6'62 p.c.	6.10	570.08

These latter figures in proportion to the number engaged in the mining production, I think, show as great an actual earning power as that of any mining country in existence to-day.

The abnormally high percentage of increase in 1901 over 1900 was owing to the fact that the latter year was one of depression in the mining industry of the country, caused by the closing down of the Pilley's Island Pyrites Mine and the Coal Mine near Howley, but above all by the prolonged strike of the iron ore operatives at the Bell Island Mines.

During the past year some new features of importance have been imported into the industry. The amount and value of local sand, used chiefly in the construction of the new waterworks, and the first shipment of talc from the country are noteworthy. The latter promises to develop into a very important feature of the industry in the immediate future. But perhaps the most note-

worthy fact connected with the mineral output for the year, is the production of 700 barrels of Petroleum, the result of a few months pumping test at Parsons' Pond Oil Field last summer. It is to be hoped that this encouraging result may eventually lead to the establishment of a refinery for treating the petroleum on the spot.

The first Gold Brick ever produced from Newfoundland ore, so far as I am aware, was obtained from a sample lot of 23 tons sent to Brookfield, N. S., by the Goldenville Mining Co., for treatment. Though the brick only contained about 11 ounces of gold, still the result of the test was very satisfactory, and affords some reason to hope that the gold production of the country may yet figure prominently in our annual statistics. The attempt at Gold Mining in Sop's Arm, White Bay two years ago has been abandoned, owing to the low average yield, and at present I do not know of any other property being exploited as a gold proposition.

There were engaged in mining and quarrying last year, as near as can be ascertained, about 2,375 persons, being an increase over the preceding year of 308. Their several occupations, the number of accidents, and fatalities are specified as follows:—

TABLE II.

	No. Employed.	Accidents.	Fatalities.
Iron Mining	1,131	8	1
Pyrite Mining	285	7	0
Copper Mining	569	13	2
Slate Quarrying	137	1	1
Talc "	100	0	0
Granite "	38	0	0
Brick Making	40	0	0
Barite Mining	28	0	0
Petroleum Drilling	12 ?	0	0
Gold Mining	10 ?	?	?
Miscellaneous	25 ?	?	?
	2,375	29	4

The percentage of accidents, as per above figures was 1.22 per cent., while the fatalities were .16 per cent.

TABLE III.

Mineral Production of Newfoundland for the Calendar Year 1904.

Name of Product.	Quantity raised.	Manufactured or used in the country.	Value of Minerals Exported.	Total value of production.
			$	$
Barite	2,000 ts*		4,750	5,000
Brick	1,236,000 M.	1,236,000 M.		11,432
Building Stone	3,100 ts.	3,100 ts.		4,650
Cobble and Spawls	4,000 "	4,000 "		2,000
Copper Ore	107,839 "		395,723	466,739
Gold	11 ozs			209
Granite	1,945 ts	1,945 ts.		11,550
Iron Ore	589,739 "		585,739	589,739
Petroleum	700 bls.	300 bls.		1,134
Pyrite	60,200 ts.		210,700	210,700
Sand & Gravel	2,320 "	2,320 ts.		5,800
Slate	2,700 "		37,800	37,800
Talc	1,562 "		7,000	7,000
Not Specified			200	200
		Total	$1,241,912	$1,353,953

In every case the long ton of 2,240 lbs. is used.

TABLE IV.

Showing Increase and Decrease in Comparison with Preceding Year.

Product.	Quantity.		Value.	
	Increase.	Decrease	Increase.	Decrease.
Barite		2,300		3,600
Brick		314,000 M.		2,688
Building Stone		900 ts.	650	
Cobble and Spawls		800 "		240
Copper Ore	20,049		123,689	
Gold		138 ozs		2,791
Granite		3,455 ts.		20,850
Iron Ore	944 ts.		944	
Petroleum	700 bls.		1,134?	
Pyrite	18,200		700	
Sand and Gravel	2,320 ts.		5,800	
Slate		1,500 ts.		25,200
Talc	1,750		7,000	
		Total	$139,917	$55,369

TABLE V.

Comparative Value of Mineral Production for 1903-1904, *based upon the Metallic Contents and Ruling Market Prices, except in the case of non-Metallic Substances, the Values of which are the Average Selling Prices of the Crude or Manufactured Materials.*

PRODUCT.	1903.		1904.	
	Quantity.	Value.	Quantity.	Value.
		$		$
Barite	2,760 ts.†	19,320	2,000 ts	13,300
Brick	1,550,000 M.	14,120	1,236,000 M.	11,432?
Building Stone	4,000 ts.	4,000	3,100 ts.	4,650
Cobble and Spawls	4,800 "	2,240	4,000	2,000
Copper (metallic)	2,710 "	789,152	3,920½	1,091,534
Gold	6,840 oz*	141,471	6,242 oz*	124,623
Granite	5,400 ts.	32,400	1,945 ts.	11,550
Iron (pig)	309,085 "	4,768,598	320,198 ts.	5,331,296
Lime	6,200 bus	600	?	500?
Petroleum			700 lbs.	1,134?
Pyrite (Sul. Acid)	171,790 ts.?	2,520,519?	201,682 ts.	2,924,389?
Sand and Gravel			2,320 ts.	5,800
Slate	4,200 ts	63,000	2,700 "	37,800
Silver	4,411 oz*	2,560	?	3,000?
Talc			1,562½ ts.	7,000
Not Specified				200
	Total	$8,357,980		$9,570,208

*Ton of 2240 lbs. †Estimated.

NOTE.—The values given in table V. differ from those in Table III., which is explained by the fact that the latter is a statement of the value of the crude materials, while the former gives the value of the refind or manufactured metals.

The differences in quantities as e.g. gold, is explained by the fact that Table V. includes not only the gold raised in the country, but also that extracted from ores such as copper, etc., when treated outside the country.

GENERAL REMARKS ON THE MINING INDUSTRY.

A few particulars with regard to individual mining enterprises and the condition of the industry generally during the past year, also a reference to those prospecive mineral substances which appear to be available for the intelligent investment of capital, may not be out of place.

Barite.

The deposit of this mineral at Collier's Cove, Trinity Bay, which has been worked the past three years, continues to turn out a good grade of material, but as the development progresses the quantity of ore raised seems to diminish somewhat. No doubt this is due to the slower extraction consequent upon the underground mining. Last year's output fell short of that of 1903 by 2,300 tons. Some 2,000 tons were raised altogether, all of which, with the exception of about 100 tons, were shipped to the Canadian and United States markets.

This material is in considerable demand for certain chemical and manufacturing purposes, and some of the higher grades of German Barite run up from $14.50 to $17.50 per ton in New York. Its more important uses at present are in the production of Barium Chloride and Oxide. It is still more largely used, especially in Europe, for the manufacture of a pigment known as Lithophone, which is a compound of Zinc-oxide or Sulphate, Barium Sulphide and some alkali metal.

The mineral is of pretty common occurrence in Newfoundland, though much of it is discolored by iron or other impurities. During the past autumn I was shown specimens of very snow-white barite from the West Coast, which to all appearances was of first-class quality. Were it carefully prospected for, there is good reason to believe that the country might in time become a large producer.

Building Stone, Cobble and Spawls.

Under these headings there is a considerable industry carried on, but it is difficult to get at all the facts. It is purely of a local character, being confined to the city of St. John's or its immediate vicinity. I am not aware whether any demand exists for this class of material outside of the city.

Most of the Building Stone is derived from the Signal Hill

and South Side ranges chiefly from the bluish and reddish sandstones of the Avalon series.

The demand for nearly all this stone comes from the contractors and builders of the city, and it is used chiefly in the construction of foundation walls for houses, etc. A small portion only is purchased by the Municipality for retaining walls and such like purposes. Of late years concrete is taking the place of this stone to a considerable extent, and has sensibly diminished the demand. Within the past year also, one of our city architects, Mr. Barter, has commenced the manufacture of an artificial stone, "Litholite," which appears to possess many favorable qualities, and may in time take the place of both brick and stone for building purposes.

This latter industry has rapidly developed in the United States of late, and has now reached gigantic proportions. All kinds of stone can be closely imitated, and, moreover, cast in moulds of any desired pattern, thus doing away with the expense of cutting or carving by hand. The probabilities are that in course of a few years this artificial product will entirely replace ordinary stone for structural purposes. Cement being the chief ingredients of its manufacture, and that material now being produced in enormous quantity, both from natural rock and from admixtures of various clays, &c., and sold at such a very low figure, it becomes possible to produce the "Litholite" at much less cost than any stone can be quarried and dressed for market. Here, however, where the cement has to be imported, and freight and duty paid thereon, it has yet to be demonstrated whether this new class of building material is able to drive the admirable Signal Hill rock out of the market.

The Cobble Stone, or water worn boulders, of the Signal Hill rock is used chiefly in the paving of gutters, side drains, and for bordering of flower plots, etc. It is nearly all purchased by the City Council.

The Spawls are the chips or flakes left after dressing the sandstone, and are purchased by the Council for macadamizing the city streets. When crushed to a suitable size this material is admirably adapted for road metal.

Considerable gravel, or rather a finer form of beach material, is used on flat-roofed houses throughout the city every year, but the quantity or value cannot easily be ascertained.

The Brick Industry.

The Newfoundland Brick & Tile Co. have abandoned their work at Elliot's Cove, Random Island, and transferred their plant to St. John's, where they have commenced the manufacture of a sand or cement Brick. The company has also changed its title to the Newfoundland Brick & Manufacturing Co. Their output for the year fell very much short of the preceding year, viz.: by 414,000, or $3,468 worth.

The three other Brick-makers of Smith Sound, Trinity Bay, increased their outputs by about 100,000, so that the total falling off in value equalled $2,788.

There is room for considerable expansion in the brick industry, as I understand the supply is not at all equal to the demand. Clays suitable for all kinds of brick and earthenware are abundant in many parts of the country, and almost any of the innumerable articles imported having clay as their basis could easily be manufactured at home.

The ceramic art, as it is termed, is perhaps the oldest in existence. It dates back to pre-historic times, and has been practiced by almost every race of people in all ages. To-day it is one of the foremost and most important of modern industries. It has been brought to an extraordinary state of perfection in recent times, and its utility is of paramount importance to civilization. Some idea of the value of the clay products may be gathered from the statistics of Great Britain and the United States. In the former country in 1902 it amounted to £1,753,884, and in the latter, in 1901, it reached $87,747,727.

Our own annual importation of all earthenware products must be very considerable, and it would appear as if here there might be a favorable opening for the establishment of a very promising local industry.

Chromite.

Nothing further has been done in exploiting our chrome deposits. The Humber Consolidated Mining Co., who hold a lease for Chromite near Bencit Brook, had their hands so full with the York Harbor Copper Mine last year that they apparently had no time to devote to the former; at all events, the branch railway

leading to this property, commenced the previous year, was not pushed forward.

It is somewhat strange that this valuable mineral, which is in considerable demand, especially for the manufacture of ferro-chromium and chromate of potash, and the preparation of refractory brick for furnace lining, etc., should not attract the attention of mining capitalists interested in such products. There are several known deposits of value in the island, and some of them are within easy reach of good shipping points.

The Province of Quebec, Canada, is a large producer of chromite, and a ready market is obtained in the United States for the entire output. In the year 1903 there were mined 3,020 tons in that province, valued at $45,300, a sum equal to nearly $15.00 per ton of crude ore, which should be a strong inducement to capitalists as there are few metallic ores now-a-days which exceed this value.

Copper Ore.

The Union Mine at Tilt Cove is again to the fore with an output of 73,082 tons Cupriferous Pyrites, while Pilley's Island is credited with 165 tons. There were raised at the new Copper Mine at St. Julien's, N. E. Coast, 280 tons, 80 of which were a high grade Chalco-pyrite. None of this latter ore has been shipped to market, the development being only in its initial stage as yet. The property has been optioned to a New York Company, and some eight or ten men have been employed, sinking and driving during the past six months. It was visited and examined during the season by a German expert, who entertained a most favorable opinion of it.

The output of Cupriferous Pyrites from Terra Nova Mine, Baie Verte, reached 19,312 tons, all of which went to the United States markets. This ore being very low in Copper has been classed by the Customs authorities under the head of Pyrites, and coupled with the Pilley's Island ore, but as its Copper content is in reality not much below that of the Tilt Cove ore, I prefer to place it with the latter as a copper ore. All this class of ores which contain sufficient sulphur are used in the manufacture of Sulphuric Acid, as well as the ordinary Iron Pyrite, but their Copper content being of considerable value is carefully extracted and save

The Mine at York Harbor, Bay of Islands, operated by the Humber Consolidated Mining and Manufacturing Co., has more than come up to expectations. During the past year active development has been pushed forward by the energetic management. An immense body of ore, some 57 feet in thickness, has been uncovered in the lower levels, the full extent of which has not yet been determined. The ore averages about 7 per cent. cu., besides containing an appreciable amount of Gold and Silver. Judging from the present aspect of this mine, it promises to become the greatest Copper proposition yet developed in the country. Some 15,000 tons of ore were raised, of which 8,200 were shipped to the United States.

The total output of Copper Ore from all the mines gave a yield of 107,839 tons, an excess over last year of 20,049, and by far the largest amount of Copper Ore the country has ever produced in one year.

The price of metallic copper in the markets ruled fairly high last season, averaging about 12 cents per lb., and reaching 15 cents per lb., during the closing months of the year. The great demand for Copper consequent upon the rapidly increasing use of Electricity as a motive power, seems to afford a most promising prospect for the future of Copper Mining here and elsewhere. Though several substitutes have of late been put upon the markets, it has yet to be demonstrated whether any of these can ever take the place of this most useful and valuable metal. Its well-known conductivity seems to have specially marked it out as the metallic substance best adapted to all purposes in connection with Electrical Engineering Science.

Gold.

The only attempt at gold mining made during the past year was that at Goldenville, near Ming's Bight. Through the courtesy of Mr. R. J. Foote, Secretary of the Goldenville Mining Company, I have been furnished with the following particulars relative to their operations, and a copy of a test made at Brookfield, N. S., where some 23 tons of ore had been sent for treatment.

The lode rock carrying the gold consists of a matrix of mixed hematite, iron pyrites, and quartz, and averages about 8 feet wide.

They are now sinking and drifting on this band, and have a large amount of ore exposed, ready for stoping.

During the summer, 23 tons of ore were sent to the Brookfield Mining Co. to be thoroughly tested. Mr. Foote himself accompanied the ore and watched the whole process carefully. It was carried out under the competent management of Mr. H. S. Badger, the company's assayist, with the following result:—

1st—By amalgamation, Bullion recovered, 8ozs. 4dwts. (retorted gold).
2nd—Treatment of tailings by Cyanide process:—

Assay value of sands ....$3.20 per ton.
" " slimes ... ...11.00 "

The value of tailings sampled at end of plates, $4.95 in gold and 21 cents in silver, or a total of $5.16.

3rd—Cyanide Test:—

Number of tons treated 1785
Average value, by separate sample and assay $4.43
Recovered in Bullion ... .3 ozs., 9 dwts.
Time of treatment ....54 hours.
Cosumption of Cyanide ... .3 lbs. per ton.
Percentage of recovery .... 82 per cent.

4th—The total recovery equalled 11 ozs. in melted gold at $19.00 per ounce, or $209.00. Value recovered per ton equalled $9.08.

A test made on concentrates from this ore gave $46.20 per ton in gold. The total cost of treatment was about $2.40 per ton. If as much more be allowed for mining and shipping, there is still left the handsome margin of profit of $4.28. This is a very favorable showing, and under careful management and treatment of the ore on the spot, should prove a profitable investment, provided, of course, the ore continues to average anything like that of the above figures. It is to be regretted that the Sop Arm Gold Mine, which gave so much promise at first, should have dropped to so low a percentage, only about 3 dwts. per ton, that it did not pay to work; consequently, operations were suspended.

The rich Bornite deposit at Cing Cerf which contained free gold in the form of considerable sized nuggets, was not operated during the year, though it would seem to offer a fair prospect for investment. I understand that it is contemplated giving this property another trial during the coming season.

I have been unable to ascertain anything with respect to the amount of Gold recovered from our Copper ores during the past

year, but if they continue to average as much as usual, i.e., about 1.5 dwts. per ton, the figures should reach between 6,000 and 7,000 ozs., worth $20.67 per oz. The latter figures are of course only approximate, and their correctness cannot be vouched for.

Iron Ore.

The iron ore industry continues to flourish and there was a small increase in the output over that of the preceding year. Owing to the fact that the Nova Scotia Company's operations are now chiefly confined to underground workings, and the extraction of the ore is much more tedious and expensive than heretofore, that company's output fell off considerably, but the Dominion Company increased theirs by the large amount of 94,632 tons which brought the total up to 589,739 tons. This gives an increase on the whole year's output of 944 tons, but as 4,000 tons still remain over, unshipped, the actual amount marketed was 585,739 tons. It is of course only natural as the ore upon the surface becomes exhausted, and it has to be won from underground mining, that the result must show an annual decline from this time forth. It is found, however, that the ore body increases in thickness and quality as the underground work proceeds, and that much ore can be won from the submarine areas.

The demand for the Bell Island iron ore continues to hold good, a very large percentage of it going to Rotterdam, as usual. In Scotland also the ore is finding favor and a market has been opened for it in the United States.

There seems some prospect of the deposits on the western portion of Bell Island being opened up ere long. This property was visited during the autumn by an expert who inspected it, and is said to have entertained a favorable opinion of it. A further investigation is proposed next spring when a diamond boring drill is to be brought into requisition to fully test the ground.

The Nova Scotia Steel Company made an attempt to mine the ore at Workington on the North Side of Conception Bay, during the summer, but failed to find it in sufficient quantity to warrant their continuing the work. It is much to be regretted that this mine has not proved a successful venture as the ore is of a very superior quality. Mr. Chambers, of the Nova Scotia Steel Co., informs me that it is an ideal character of Hematite, "just that class of iron ore that iron manufacturers are looking for."

PEAT.

The various attempts to manufacture peat fuel on this side of the Atlantic especially in Canada, have not met with that measure of success which was anticipated at first. Several different processes have been tried, each possessing certain merits of its own, but though the products have met with ready sale in districts where other fuel is scarce and dear, yet so far no peat fuel industry on a commercial basis has been established. Nevertheless, the belief is growing that ultimately the efforts of those experimenting in this direction will be crowned with success. This belief is strengthened by the fact that in several countries of Europe, notably in Great Britain, Norway, Denmark, Germany, and Holland. its manufacture is now well established, and long beyond the experimental stage. In Holland especially, it has been a complete success.

Some of the most up to date methods of these latter countries are being introduced into Canada, and last year the Dominion Government caused a special investigation to be made into the extent and probable value of their available peat resources. From the report of Mr. R. Chalmers, Ll.D. who was told off for this especial work, I gather much valuable information. "Approximately there "are 37,000 square miles of peat bogs within the several provinces "of the Dominion. Many analyses of the peats have been made "which prove them to be of first class material. It is fully believed "that the time is approaching when those peat resources will be- "come assets of great future value to the country."

The latest process for the manufacture of peat fuel, and the one which seems to most nearly realise the aim of those interested in the business is by the use of the Electrical current as a drier and carbonizer. "The peat is first deprived of a great part of its con- "tained moisture by being rapidly revolved in a rotary cylinder, "aided by internal heat. Electrodes connected by conductors with "a dynamo are then inserted into the cylinder, in such a manner "that the mass of centrifugally-dried peat becomes the medium "through which the circuit is completed between the electrodes. "The resistance offered by the peat generates heat sufficient to car- "bonize the material, producing a mass of black globules. This "carbonized material then passes to a machine where it is moisten-

"ed by some sort of chemical and kneaded into a putty-like mass "when it is pressed into briquettes."

It is claimed for this process that the carbonizing of the peat by the electric current does not destroy any of the valuable elements of the peat, as is the case when cokeing is performed by ordinary fire heat in which a large proportion is lost, being either consumed or driven off in the form of gas. Fuel so prepared is said to have a thermal value of 9,000 units, and to be fully equal, ton for ton, for steam generating purposes to Welsh coal.

It is also stated that it can be produced for $1.21 per ton, whereas coal at the pits' mouth costs $2.02. These results are based upon the most favorable local conditions for operating with an electric current generated by steam, but where good water-power is available the cost could be materially reduced.

I need scarcely point out that here in Newfoundland we possess an unlimited supply of the very best quality of peat, while water-power is obtainable on almost every river in every section of the island.

Petroleum.

The operations at Parsons' Pond oil field during the past season, according to the report of the superintendent, Mr. Powell, were of a nature to afford much encouragement to those who have so persistently prosecuted the work of drilling for the past ten years.

One hole which had been partly drilled the year previous to a depth of 600 feet was continued down to 2,050 feet. Oil was struck at depths of 1,470 and 1,750 feet. This well yielded on an average two barrels of petroleum per day. In conjunction with three of the older ones, it was then put to pumping, and after a two months' test the following was the result:—

Tank well, oil per diem	1½	barrels.
1,200 foot well, per diem	1½	"
Spottswood well, per diem	1	"
2,050 foot well, per diem	2	"

A new well on the north side of the lake, also commenced the year before, was continued down to a depth of 1,550 feet, when the best show of oil yet met with in the district was encountered. This well was pumped continuously for nearly five months and

gave a steady yield of 4½ barrels daily. The oil produced was entirely different from any previously met with in the region. It was of a light amber color, and of great body. Mr. Powell does not think it will show a high percentage of lighting oils, but believes it to be exceptionally rich in the more valuable lubricating oils, paraffine, waxes, and other by-products. He states that he tried it as a lubricator on the engines and found it so satisfactory that he used nothing else afterwards. This oil is of a much higher class than the ordinary Pennsylvania illuminating oil, and is also much more valuable. Another well on the same side of the lake was drilled to a depth of 1,400 feet, but yielded very little.

The five wells pumped gave a total yield per diem of 10½ barrels, although as yet none of them have been torpedoed. It is thought that after undergoing this operation the yield would be greatly increased.

Altogether 700 barrels of petroleum were obtained from the five wells, of which 400 barrels are stored in tanks on the ground, the other 300 barrels having been consumed as fuel to run the drill with.

Pyrite.

The returns from Pilley's Island did not reach me till a few days ago, owing to the snow blockade which has deranged the mail service to such an extent. The output of Pyrite for the past year was far in excess of any that preceded it, being 60,200 tons of ore valued at $210,700. The Baie Verte returns also came to hand by the same mail, but for reasons already given I have included this under the head of Copper Ore.

I could not learn much about the pyrites mine at Rowsell's Harbor, Labrador, which is now in the hands of the Dupont Powder Company of Wilmington, Deleware. I understand that during the summer some sixty men were employed developing the property, and a considerable amount of work was performed. The deposit is reported to be a very large one, and the ore high in sulphur. It also contains a small percentage of Gold.

Several shafts were sunk and drifts made along the course of the lode, and some twenty or thirty tons of ore, as a test sample, were shipped to the United States. During the summer several shiploads of machinery, provisions, and requisite implements, etc.,

were sent down. Owing to the scarcity of timber, portable houses for the miners were also taken to the locality, and erected during the open season.

A small force of men under Captain Bartlett are wintering on the spot, and pushing on the underground work. It is expected the coming season will witness the commencement of regular shipments of ore. In the course of a very few years this new source of pyrite is likely to add very materially to the mineral output.

Radium.

In connection with the mineral development of the island, it may be worth noting that within the past year some new sources of the remarkable element, Radium, have been discovered in Canada. Heretofore, it was supposed to be confined to certain ores of uranium, especially Pitch-blende, and under the supposition that this would prove the chief source of the rare element, the Austrian Government had prohibited the exportation of this ore from Bohemia and Hungary, where it occurs in some quantity. Under these circumstances the discovery of other radio-active substances more especially on the Western continent, was hailed with much satisfaction in scientific circles.

To Mr. Obalski, inspector of mines for the Province of Quebec, Canada, is due the credit of bringing to light these new discoveries. A mineral which he identified as Cleveite, from a mica mine on the lower St. Lawrence, "produced distinct radiographs upon "sensitised photographic plates, of coins, and other objects, after "the rays emanating from the specimen had traversed opaque "bodies of wood and metal. It was afterwards found that the min- "eral perceptibly discharged the electroscope, clearly indicating "the possession of pronounced radio-active properties." An analysis of this mineral gave 70.71 per cent. of uranium.

Mr. Obalski also discovered that the ashes derived from a species of carbonaceous material, called Anthraxolite exhibited strong radio-activity. He read a paper describing and illustrating his discovery before the Toronto University, which created quite an unusual amount of interest, and drew forth a great deal of discussion from several eminent scientists present. In the course of this discussion Prof. McLennan of the University of Toronto, instanced the fact that while experimenting in the laboratory on some petroleum products of Canada, he found that the emanations

from a certain class of these products exhibited distinct radio-activity, and that the lower down in the geological series the petroleum was derived from it showed the strongest indications.

It is highly probable that some of those radium-containing substances may be found to exist either in this island or on our Labrador territory. Two of the substances named at least occur on the island, viz.:—Anthraxolite, and Petroleum, the latter of which is derived from the lowest known series of rocks that have yet yielded petroleum in any appreciable quantity. Ores of uranium seem to favor granite rocks, and may be expected to occur in the Archæan series so widely distributed on the Labrador Peninsula and the northern and central portions of our own Island.

In view of the very great value of this rare substance, ores containing it will be eagerly sought for and their discovery hailed with much pleasure by scientists. Mr. Obalski even suggests the advisability of the Dominion Government offering a bounty to encourage the search for such ores. The Swedish Government have already put this idea in practice, by giving bonuses for specimens found. I have read that radium has been discovered in considerable quantity in that country, in an Alkaline metallic earth containing uranium.

Slate.

The slate returns from the Wilton Grove quarry exhibit a considerable falling off, being but a little over half the output of 1903. This was chiefly owing to a disastrous fire which occurred in the early part of the season, by which much of the plant of the quarry was destroyed and the development work thereby greatly retarded.

Nothing was done with any of the other slate properties in Trinity Bay, so far as I can learn. At the Summerside slate quarry, Bay of Islands, quite a lot of work was accomplished in stripping and preparing the way for active operations. Mr. Owen, the manager, informs me that the deposit has now been fully proven to be of great extent and of first class quality, and that quite a lot of slate was manufactured, though as yet none has been shipped abroad. Another quarry was also opened on the south side of the Humber Arm, by an American company, at a place called Crow's

Gulch, on the strike of the same belt. Some fifteen men are now employed unstripping this slate, and they expected to begin actual quarrying next spring. Mr. Owen, who is a practical man of long experience, speaks quite confidently of the prospects of these quarries, which he pronounces to contain slate of the very best quality.

Talc.

The deposit now being operated near Manuels, south side of Conception Bay, though not properly speaking a true talc, has been so named and classed in a commercial sense, and appears so under that heading in the customs exports. Properly speaking it is a silicate of alumina and potash, with little or no magnesia, and would appear to approach nearer in composition to a material known as agalmatolite, or figure stone of the Chinese, than anything else.

The company operating this property, and known as the North American Talc Co., were actively engaed all summer constructing an overhead tramway from the mine to the railway, and also a loading pier near Seal Cove, about 10 miles further up the bay. A staff of men were employed most of the time quarrying the rock at Johnny's Pond, and sorting it for shipment. It was, however, late in the autumn before they were in a position to ship their first cargo, which amounted to 1,750 tons. This was sent to Portland, Maine, where the company has a large establishment for grinding the material and converting it into marketable condition.

The result of this first shipment is not, so far as I am aware, made public yet, nor is it known whether the product will fulfil all that is claimed for it or otherwise. As a paper filler, it is said to be fully equal to the best Talc, while it is also said to possess valuable properties applicable to the manufacture of porcelain and china-ware, etc. Should the expectations of this company be realised, there is certainly room for a great enterprise in the exploiting of these Talc (?) deposits, which extend over a considerable area of country and must contain many millions of tons of the material.

Miscellaneous.

It is unnecessary to enumerate here the various other metallic and non-metallic substances which are known to occur in the coun-

try. These have been fully dealt with in former reports, especially those of 1898-99 and 1900. Some at least of these materials deserve the attention of capitalists, and I may here say that I have frequent enquiries for information regarding them. This has been particularly the case in respect of ores of Zinc Molybdenite, Pyrite, Asbestos, Fluorspar, etc.

Of the many beautiful Granites, Sandstones, Marbles, Serpentines, Slates and other building or ornamental materials which the country possesses in abundance, I feel that they only require to be known properly, to have the attention drawn towards them which their merits deserve. The surest wa yto obtain this end is by exhibiting good specimens on every available occasion where expositions of natural products take place, particularly in countries likely to become purchasers of the raw materials. It is to be regretted that we have not availed much of such opportunities in the past, though frequently solicited to do so. The Canadians are fully alive to the value of this mode of advertising their varied and valuable mineral resources. Not only are local exhibitions held in the several provinces, but almost every year they take part in some great international affair of this kind, with marked results of a beneficial character.

In conclusion, it may not be amiss to draw attention to the need of a properly constituted system of Governmental inspection of our mines. The number of bread-winners now employed in this industry, with those depending upon them, must represent at least 10 to 12,000 individuals, which is fully 6 per cent. of the total population of the Island. The frequency of accidents of a serious character and the rather excessive proportion of fatalities of late, certainly calls for consideration. No doubt most of those occurrences are due entirely to the carelessness of the miners themselves, especially in handling dynamite. They seem to utterly ignore all rules and warnings, and it appears as if some means should be devised to compel conformity with ordinary precautionary measures.

I have the honor to be, Sir,

Your obedient servant,

JAMES P HOWLEY.

Geological Survey of Newfoundland

REPORT

UPON

Exploration and Boring Operations

IN THE

Central Carboniferous Basin near Grand Lake, 1904

By

JAMES P. HOWLEY, F.G.S.

ST. JOHN'S, N.F.
Robinson & Company, Limited, Press
1917.

REPORT

ON

Exploration and Boring Operations in the Central Carboniferous Basin near Grand Lake, 1904.

Geological Survey Office.
St. John's, January 25th, 1905.

HON. J. AUGUSTUS CLIFT, K.C.,
Minister of Agriculture and Mines.

SIR,—I beg to hand you the following report upon the past season's operations in the central or Grand Lake coal basin.

Before entering upon the description of the work in question, it may be advisable to give a short general resume of the preceding operations in this particular district. This would seem to be the more necessary, as few persons have any idea of what has been accomplished, or of the difficulties that had to be met and overcome in carrying on the investigation from the outset. It will also tend to elucidate the whole subject more thoroughly, and, it is hoped, be the means of removing some misapprehensions which appear to exist.

Previous to the advent of the railway, the region surrounding the Grand Lake was by no means easy of access. To reach it from St. John's or return therefrom, usually occupied a full month each way. To accomplish the journey with a whole season's outfit of camp equipage—provisions, tools, etc.—was a very arduous undertaking; yet it was under such conditions the earlier explorations were carried out.

The country surrounding the head of the lake, and for many miles to the North and East, is a low-lying flat or undulating plain, covered with marshy swamps, small ponds, and wooded ridges. A vast deposit of superficial debris, consisting of sand, gravel, and innumerable boulders, covers this plain in every direction. Many of the boulders are of enormous size and cannot be removed by any ordinary means. The thickness of this surface deposit varies considerably, frequently exceeding one hundred feet, and in some in-

stances even one hundred and fifty feet, as was found to be the case near the shore of Grand Lake. Nowhere on the surface is there anything to afford the slightest indication as to the probable depth at which the underlying rock formation may be reached. To do so by sinking pits is therefore, to a great extent, a matter of conjecture, or otherwise of mere chance. Yet close observation extending over several years' study of every feature, and knowledge obtained from previous attempts often futile, has afforded data whereby some sort of a conclusion on this head can be reached, and this knowledge was availed of during the past season to a considerable extent.

The first authentic account of the existence of coal in this region was obtained by the late J. B. Jukes, M.A., F.G.S., F.C.P.S., an eminent geologist, who, in the year 1840, made a cursory examination of portions of the western side of the Island. In company with an Indian guide he visited the Grand Lake, and upon a small brook flowing into it near its S. E. corner, since named Coal Brook, he observed one small seam of coal about six inches in thickness. He conjectured from the character and attitude of the rock formation there exposed that there should be other and more valuable deposits somewhere in the district.

From this date till the advent of the late Alex. Murray, C.M.G., F.G.S., no further attempt was made to explore the country. In 1865 Mr. Murray traversed that section between Hall's Bay and Bay St. George by way of Indian Brook, Sandy Lake and river, and the Grand Lake, all of which he surveyed and mapped out. He visited the place where Jukes had seen the coal, but in the interim it had been completely hidden by fallen debris and was not then visible. Numerous fragments of coal were however observed strewn along the shore, near the head of the Grand Lake. The next year he ascended the Main Humber River as far as the big fall, but though the Carboniferous series was ascertained to spread over a vast extent of the Humber Valley, it was only the lower and unproductive portion that was met with. The comparatively low angle of inclination at which the strata dipped toward the southward left little room for doubt that higher strata, bringing in possible true coal measures and available coal seams, must be looked for in that direction. A later investigation on the upper reaches of the Humber, carried out by myself in 1879, confirmed this

conclusion In the latter year the Government purchased a boring outfit, and employed a Scotch driller to put down some holes near the head of Grand Lake, where the loose coal had been seen.

Owing to the difficulty of getting heavy material on the ground in the then condition of the country, the season was far advanced before drilling operations were actually commenced, and but one hole was put down that year, to a depth of 250 feet. Two small coal seams were passed through, the largest being but sixteen inches thick. During the following year (1880) two more holes were bored further up the Sandy Lake River, with no better results. It became quite evident that a mere fringe of the coal measures only had been struck.

Up to this date all the evidence obtained was rather of a negative character, yet it was not without value. The area in which workable seams might be expected to occur had now been narrowed down to that portion of the district lying between the Grand and Sandy Lakes. This, however, was the most difficult part of the entire region to explore, owing to the nature of the surface, the absence of any means to penetrate the thick woods or move heavy machinery about. But what added most to the difficulty was the complete absence of any outcrops of the rock formation which would afford the slightest clue to the structure beneath.

The mystery remained unsolved, and not until 1891-2 was another attempt made to unravel it. In the latter years a more systematic plan was adopted, and a determined effort entered upon to prove something conclusive. The Geological staff, with a crew of eight or ten men, and an outfit of picks and shovels, again visited the Grand Lake. The lake itself and all the small brooks flowing into it on the south side were carefully re-surveyed, and most minute investigation carried out. Close up under the foot hills, lying to the south of the lake, some rock exposures were discovered. Upon stripping these, by removing the timber and then the surface soil down to the bed rock, good sections were exposed to view. They consisted of true coal measures doubled up in the form of a sharp, narrow synclinal trough, holding seams of coal of varying thickness. On Aldery Brook thirty outcrops, representing fifteen separate seams, were found. Three miles further east, on Coal Brook, another section showed eighteen outcrops, or nine distinct seams, while on Kelvin Brook, two miles still further east,

six more outcrops were discovered. Ample evidence was obtained of the continuity of this coal trough between the above named points. Details of this work are to be found in the reports for 1891-2 under one cover.

Beyond Kelvin Brook the country assumes such a low flat character, and is so completely covered with superficial debris in all directions, that notwithstanding the most diligent search, no other outcrop of the coal measures could be anywhere met with. It became quite evident that the use of a boring machine would have to be again resorted to for the further testing of this promising coal basin.

The Government, at my suggestion, now reserved the area supposed to contain coal from lease or grant to private parties, and in the following year 1893, purchased a Sullivan Diamond Drill for the purpose of testing the ground more thoroughly. The delays in shipping, and the difficulties in getting the machine on the ground were so great that it was the month of August before it reached its destination at the head of Grand Lake. Drilling was commenced near the Lake-shore on Kelvin Brook, but such an incredible amount of drift material was encountered, and such a vast accumulation of boulders were lodged beneath the surface soil down to depths of over 130 feet that after three separate attempts to penetrate to the bed-rock, the place had to be abandoned and the whole outfit moved a mile further South. Here the bed-rock was struck at a depth of 105 feet, and the bore hole carried down to 335 feet altogether. It became evident that the section passed through was too low down in the series to expect any coal seams of value. A few thin streaks of coaly matter and some black shales were met with, but nothing that could be called a true seam. The information obtained clearly indicated that the true coal measures lay still to the Southward, and were here confined to a narrow strip lying close along by the range of hills which bounded the valley on that side.

It was a great mistake not to have continued the boring operations after that date, but various circumstances including the unfortunate Bank crash of the following year, caused a suspension of the work for the time being.

During the season of 1895 the railway construction having reached the vicinity of the Grand Lake, I was informed by Mr. R.

G. Reid, Sr., that in the gravel-cuts between Kitty's Brook and the crossing of the Sandy Lake river, numerous fragments of loose coal were come across, and at his earnest solicitation the Geological staff were again sent out to try and locate the seams from whence this coal was derived. It was well up in August before we arrived on the ground, and after a cursory examination of the surface, a point near Goose Brook was selected for trial. With the aid of pick and shovel, work was commenced near the railway track, and after a short while a coal seam was discovered which on being fully uncovered gave the following section:—

	ft.	ins.
Fire-clay	4	0
Coal with clay streaks	0	10
Clay	0	1
Coal fairly good	1	1
Clay	0	2
Coal, soft and shaly	1	5
Total	7	7
Coal	3	4

Indications of other seams in the same locality were not wanting, but the season was too far advanced to effect much more work with such inadequate means as were at our disposal.

This find was a great step in advance and afforded a clue to the true structure in this part of the region, which was invaluable. We now had hold of the coal basin again in a part of the country far removed from the hill range, and at a point 3½ miles east of Kelvin Brook, or just eleven miles on the strike from the furthest western extremity of the trough. It proved beyond question that the conclusion which had been arrived at as to the prolongation of the coal trough into the flat country was correct, and that the liklihood of the trough widening out in its eastern extension was very probable. Had this clue been followed up at the time we would now be in possession of much more information of this central coal basin, but the prosecution of the investigation was again deferred.

Under the terms of the railway contract of 1898, the whole of this coal reserve was handed over to the Messrs. Reid who com-

menced mining operations on some of the seams at Aldery and Coal Brooks, also on the seam last discovered near Goose Brook. They continued to work them till 1900, taking out some 8,000 tons of coal which they used on their locomotives. They did not make any effort to further explore the coal field by means of the boring rod which was clearly the proper way to arrive at any definite conclusion as to its extent or dimensions.

By the 1901 contract this coal reserve again reverted to the Colony, and in 1903 the Messrs. Harmsworth, by an arrangement with the Government, undertook to explore it and apply the boring machine to test the ground. An expert from Philadelphia visited the place and inspected some of the seams operated by the Messrs. Reid, but no boring was instituted nor was any attempt made to further explore the region.

This is the history of the Grand Lake Carboniferous district down to the past season.

Coal Exploration of 1904.

The Government having appropriated $10,000 during last session of the Legislation for the further prosecution of the work, a Davis Calyx drill was purchased from a company who had imported it a few years ago, and an expert drill-man from New York was employed to run it. As soon as this man arrived he was despatched to Baie Verte where the machine was stored, to procure it. Numerous delays occurred before it could be placed on the ground near Goose Brook. At Pilley's Island the steamer *Greyhound* was found unserviceable, and it was several days before she could be put in a condition to make the trip North. In the meantime, before she arrived back at Lewisporte, a great forest fire had laid waste the entire district. At Notre Dame junction everything had been swept away, including the station, telegraph office, and portions of the railway track. In consequence of this disaster no communication could be had with the drill-man, Brady, nor was it till several days had elapsed that I learned of his whereabouts. I then started for Goose Brook where he had preceded me. Mr. W. Haddon who had been despatched in charge of the crew several days previously, had orders to select a suitable camping ground, cut wood for firing the boiler and make other necessary arrangements for the season's work. Another week elapsed before

the railway connections were fully re-established, or the machine could be brought along. When at length it did reach us it was found to be in a very incomplete condition. The wooden frame and drill head were intact and in good order, but the engine proved to be a second-hand one and not belonging to the outfit at all. There was a box of tools some small fittings, and but 100 feet of drill rods, while the capacity of the machine was between 800 and 1,000 feet. The most essential parts of the outfit were entirely absent. There was no boiler to generate steam with, no pump, no stand or casing pipe, no forge, anvil, vise, besides a great dearth of connection pipes, valves, joints, cutting bits, &c. The engine lacked a governor for regulating the steam-pressure, and a lubricator for keeping it properly oiled.

All these essentials had to be procured before it was possible to enter upon boring operations. The Angel Engineering Co. furnished most of the smaller items, but the boiler, pump, drill rods, core barrels, cutters, &c., had to be ordered from New York.

Numerous delays in shipping and railway carriage brought us up to an advanced date in the season before everything was in readiness for boring. Long previous to this time the ground had been prepared, and a hole sunk to the bed-rock at a suitable point near the railway track, about a half mile east of Goose Brook.

Boring was commenced on August the 13th. The strata first met with was extremely hard, being chiefly a coarse, gritty sandstone, through which our progress was very slow. After cutting through some 35 feet of this character, the rock became finer grained and was more easily bored. This again was succeeded by shale and clay with occasional thin sandstones. The shale was characterized by holding fossil plants, stigmaria rootlets, and a few thin coaly streaks. Nodules of kidney iron-stone were of frequent occurrence in the more clayey strata, all of which clearly indicated the presence of coal seams at lower depths.

When a depth of 91 feet had been attained, the sides of the hole began to cave in badly. About this time also our drill-man, who had been complaining for quite a while with some throat affection, became so ill that he was obliged to come on to St. John's for medical treatment. He was ordered to proceed at once to New York to consult a specialist, and we were thus left in a very awkward position. A few days previous to his leaving, Mr. Andrew

Aylward, a practical mechanic, well versed in the handling of steam, and running of marine engines, &c., joined us. He had no previous experience, however, with boring machines of this character, yet there was nothing left to do but give him full charge of it.

It was now found that the hole was so badly caved in that all efforts to clear it proved unavailing. We were compelled to abandon it and commence all over anew. The heavy machinery had to be disconnected and moved several feet; new connections made and stand pipes readjusted. All this work caused considerable delay, but we were ready for boring again on the 23rd of September. From that date, by feeling our way carefully along, we made very good progress, and were again down 90 feet when we were called home.

The section passed through in this hole was of course similar to the first, and did not afford any new data.

The boring machine is certainly a good one, and with a few improvements in the way of cutting tools, can do very effectual work. It was found that while the chilled steel shot was admirably adapted for cutting hard sandstone, or clean rock, it had very little effect upon soft shale or clay. The shot became embedded in the soft material and took no effect on the rock; on the other hand, the toothed-cutter, provided for this class of material, was not much more serviceable, as the teeth became clogged. It would appear from the above facts that the machine is open to considerable improvement in this respect.

The greatest drawback, however, to the successful prosecution of a work of this kind is the necessity of sending abroad for almost every item required in the course of operations, and the delay that is certain to occur in procuring them. Almost every day's drilling, or every change of strata, calls for some special tools or fittings which may not form part of the regular outfit, and unless such can be quickly procured, the work is apt to be hung up for the time being. During the season tools for such purposes had to be improvised from such materials as were at hand on several occasions.

Previous to the arrival of the boring machine, and all throughout the season, such of the crew as were not engaged about the drill were kept busily employed sinking pits, making a road for trans-

porting the heavy material from place to place, cutting firewood for the boiler, &c. Nearly a mile of good road was constructed, and an enormous amount of trenching and sinking performed. Although baffled in most instances in the attempt to reach the rock formation, owing to the great depth of the superficial deposit, and the influx of water almost everywhere, nevertheless we were so far successful as to obtain a good general idea of the underlying structure.

The section exposed in these cuttings, together with that obtained by the boring, aggregated at least 1,000 feet in vertical thickness. Fully 800 feet of this strata cannot be otherwise classed than as a portion of the true coal measures. They consist of sandstones, coarse and fine, with alternate strata of shale and fire-clay, containing fossil plants, stigmaria rootlets, characteristic of this portion of the great Carboniferous series. Fragments of coal were come across in almost every cutting, and streaks of coal or coaly matter in most of the fire-clays. Two genuine coal seams, besides some smaller ones, were uncovered, but at such depths down, sometimes from 18 to 20 feet, that it was all but impossible to properly test them. One of these seams, which is about 60 feet lower down in the section than the old seam of 1895, upon which the Reids did some work, gave the following measurement:—

	ft.	ins.
Underclay	8	0
Clay coal and shale mixed	2	8
Carb, shale and clay	1	4
Coal fairly good but shelly	1	4
Top clay and shale	0	6
Total	13	10
Coal	2	6

Sixty-five feet in front of the old seam another occurs, in which there is one foot two inches of coal, underlaid by a thick bed of fire-clay. Thus we have here in a vertical thickness of only 130 feet of the measures three separate coal seams of fair size, though of rather poor quality. There is reason to suspect the existence of other seams lower down in the section, which could not be reached with pick and shovel.

The most important result of the season's operations is the clear and unmistakable evidence now obtained of the existence of a larger and more promising trough of the coal measures, or rather extension of the original trough, than was hitherto known. It is true that as yet we have only got hold of the southern side of it, and have no definite idea how wide it may be, or how far it extends. These are points still to be determined. At all events an unbroken section of fully 1,000 feet all dipping in one direction, towards the north, is here displayed. There is no indication that the centre of the trough has been reached, and to all appearances there may be a thousand or more feet of still higher strata in the section, all of which must be repeated on the other side of the trough.

Another important point ascertained is the fact that this portion of the coal trough is far removed from the hill range; it occupies the flat country and therefore has room to expand both laterally and longitudinally over a very considerable area, nor is it so liable to be badly faulted. It may be added that the work of the past season bears out exactly what has been stated in former reports as to the widening out of the trough in this direction, &c.

I shall not be surprised if on fuller examination this coal basin will be found to attain a thickness of measures not far short of the Sydney coal trough which comprises between 1,800 and 1,900 feet. Owing to the higher angle of inclination it will not here of course occupy so extensive a superficial area, nor does it follow that it should contain the same number or character of coal seams.

The season throughout was an exceptionally fine one, and most favorable for the prosecution of the work. The months of July, August and September were excessively hot and dry, the heat at times being almost tropical in its intensity. During all my long experience in the interior I do not remember such a period of prolonged heat.

During the progress of the work a substantial shack was erected in which, when leaving, all the machinery tools, &c., except the boiler, were stored. The boiler was housed in where it stood, and everything carefully protected from the weather.

In view of the importance of the possession of available coal in the island, and the effect it must inevitably produce on the future of the mining development generally, I would again strongly urge the advisability not only of reserving this coal area, but of

the Government acquiring, if possible, all the areas or prospective areas in which coal is likely to occur elsewhere in the country.

I would respectfully suggest that in future no fee simple grants of the coal be issued to any person, so as to avoid the locking up of this valuable asset indefinitely. These areas should only be leased on an annual royalty to capitalists who would undertake to operate them, and who would enter upon their development with as little delay as possible, the lease to cease so soon as the lessees failed to fulfil their obligations. I do not think it would be advisable to lease all the areas to one company, as it might be to its advantage to operate but one mine and pay all the royalties thereon. Unless something of this kind is carried into effect ere it be too late, the mining industry may be seriously if not irreparably injured.

These remarks are founded upon the history of Nova Scotia and Cape Breton, whose valuable coal areas were for a lengthened period held by absentees in England, under old leases from the Crown, to the great detriment of those provinces. In the end the Provincial Governments were compelled to repossess them at an enormous cost. With such an example before us we should try to avoid falling into a similar error.

Trusting these remarks will be received in the light in which they are intended viz., in the best interests of the country.

I have the honor to be, Sir,

Your obedient servant,

JAMES P. HOWLEY.