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CIRCULATION.

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CONTENTS.

PROFESSIONAL ETHICS, WILD-CATTING, AND LEGISLATION.

For some weeks the Toronto branch of the Canadian Mining Institute has been holding special meetings to consider the repression of wild-catting. The aim of the branch has been to suggest the basis of restrictive legislation. Up to the present all attempts to draft a memorial embodying the views of the meeting have failed. Not more than a very few individuals concur in thinking any one specific restriction effective. This divergence is, of course, inevitable. And it signifies that we have been placing the cart before the horse.

In other words, the evil must first be defined, diagnosed, and isolated. Only then can we hope for some degree of unanimity as to the remedy.

What is wild-catting? To our mind wild-catting may best be defined as an attempt to sell mining shares to the public under false pretenses. Usually such attempts imply excessive capitalization, incomplete and exaggerated descriptions of the physical basis of the flotation, undue emphasis laid upon certain incidentals, and the repression of vital facts as to financial arrangements. Briefly, the subornation of the public press makes possible this evil. Paid reading notices, flashy advertisements, and faked despatches are the weapons that the press provides, at a price, for the wild-catter.

Our legislatures also are not blameless. Our legal machinery provides every facility for the wild-catter. He is permitted to foist the most vicious schemes upon the public. Not only is this true, but it is also true that he receives all necessary privileges without question and without a moment's investigation. Dummy directors and other expedients make it easy for anyone, be he bank manager or escaped convict, to call into existence millions of shares in corporations that are commercial nightmares.

Upon the legal luminaries who sell their services as organizers blame also rests. It is surely possible for the lawyer to draw the line somewhere. Precedent and professional habit may justify in some degree the impersonal attitude of the legal adviser; but it is going too far to claim that any professional can so reconcile the evident conflict between morals and business as to feel no compunction in helping to launch companies that are conceived for the express purpose of robbing fellow citizens.

The small investor himself is not clear of blame. Animated by cupidity he eagerly gulps down the baited hook. And when the barb strikes he complains to the world at large of the hard usage that has been accorded him.

But, since wild-catting is done in the name of mining, and since the welfare of the industry and the honour of the profession are affected by it, it assuredly is the first duty of the mining engineer to do all that he can, privately and publicly, to discountenance unsound projects. In the main, the mining engineer is far too diffident in this direction. Often, we regret to say, he is even complaisant. Though his report be put to illuses, he contents himself with shrugging his shoulders and maintaining a discreet silence. Here, specifically, professional ethics must be revamped. We have no patience with a negative scheme of ethics. The professional mining engineer, to fulfil his functions as a citizen, to do fairly by the clients who employ him and by the public that trusts and respects him, must be positive, constructive, and aggressive. In season and out of season he must condemn the spurious.

Not all the resolutions in the world can have as strong an influence as the openly expressed opinions of responsible individuals.

Wild-catting is only one manifestation of a prevalent disease. It is not to be cured by patent medicines nor by the knife. But it succumbs readily to open-air treatment.

THE TARIFF.

Although mining interests are not directly concerned with the free exportation of pulp wood, yet indirectly the question is fraught with large meaning for them. The manufacture of sulphite pulp in Canada implies the exploitation of our iron pyrites deposits and the local manufacturing of sulphuric acid. In the mining of iron pyrites there is not a large profit. In the manufacture of sulphuric acid there is a large profit. But the market is limited, and is susceptible of expansion only as our home industries grow. The demand for sulphite-pulp is expanding. If we consent to ship our crude pyrites to the United States, and also to ship our pulp-wood there, we are by way of losing all but nominal profits and of denuding ourselves at a rapid rate of natural assets that are yearly becoming more valuable.

As regards legislative control, it is to be noted that only the Federal Government can prohibit the exportation of pulp-wood from privately owned lands. Provincial Governments can forbid the exportation of pulp-wood from Crown lands only. Thus, whilst the Dominion Government has shown its willingness to remove all barriers, the Provincial Governments are still competent to prevent the wholesale destruction of our pulp-wood forests.

This is but one example of the complicated relations that obtain in mining, milling, and marketing any given mineral. How far Canada is prepared to make concessions is a matter for our plenipotentiaries to determine. Any concession that it is possible to make, so far as mining is concerned, is limited by the volume of trade now existing in one or all of certain specified mine products. Or, rather, these concessions are limited by the probable expansion of trade indicated by the tariff revision.

But since this revision is provisional entirely, and is dependent for effectiveness upon the consent of astute but temporizing politicians, let us rather say that upon the confirmation of this revision rests the expansion of our mineral trade.

Genuine reciprocity, which is to be sharply distinguished from reciprocity as arranged in view of political exigencies, will give certain of our natural products a much better status. For instance, gypsum might be manufactured in Canada for all Canada east, and for the eastern consumers of the United States. But this cannot be unless we are put on absolutely equal terms with United States producers.

It were useless to multiply instances. The basic principle remains. We are bound to retain in Canada the ultimate profit from our products. They must be turned over to our customers in as finished a condition as possible. This is the whole meaning of the tariff to us. Sentiment can be disregarded. We are all British. But, also, we are all merchants. We must sell our commodities, whether they be brains or pork, in the best market. The historic fact remains that heretofore all of our bargains with the United States have been expensive for us. Let us calmly and coolly decide whether this bargain is or is not to our advantage. If it is to our advantage, then we shall be so much the bigger factor in the Imperial Federation.

THE YUKON IN 1910.

In length the past dredging season has exceeded that of any previous year. Beginning in April, dredging was continuously carried on until December 13, a period of 233 days. The output of gold was greater by half a million dollars than in 1909. Operations have been measurably cheapened during the past twelve months both by the installation of larger dredges and by the distribution of electric power.

The output of 1909 was valued at $3,560,000; that of 1910 aggregated $4,100,000. To this enhanced yield the dredges of the Yukon Gold Company on Bonanza and Hunker contributed most. It is confidently expected that the coming season will witness a very much larger growth from this company's dredges and giants.

The Treadgold interests are now prepared for a vigorous campaign on Last Creek, Dominion Creek, parts of Quartz Creek, and possibly other streams. The huge power ditch is practically finished, and distribution lines are in place.

The Canadian-Klondyke Company, on the Boyle concession, below Bear Creek, had a successful season. Other companies are operating on Fortymile, and on Stewart.

All things considered, it looks as if Yukon can fairly look forward to the coming season with a well-grounded expectation of touching the six million mark.

The agitation for good roads in the Yukon should bring relief to many operators. It may be noted, incidentally, that rapid time has already been made in a motor-car between Whitehorse and Yukon Crossing.

In Southern Yukon preparations are being made to provide for the shipment of large quantities of copper ore from Whitehorse to Skagway, thence to the Tacoma smelter. Iniquitously high railroad freights have heretofore paralyzed this enterprise. The action of the Railway Commission in cutting down these rates has relieved an intolerable situation.

Coal-mining has been active. As it reflects directly the condition of the dredging industry, it will almost certainly prosper.

* * * * *

The conviction that the Yukon is no longer a poor man's country may require qualifying. Whilst there is no questioning the fact that the greater part of the country's annual wealth will be won by large and highly organized corporations, yet we are inclined to believe that the enterprising prospector still has a good chance to attain success. The Yukon is fast becoming a stronger factor in our national economy. There will be prizes for more than a few in the successful exploitation of so vast a region.

THE IRON ORE RESOURCES OF THE WORLD.

The eleventh International Geological Congress assumed the task of estimating the present developed and partly developed iron ore resources known to-day. The total aggregate weight of iron ore is estimated by that body as being 22,408,000,000 tons. This quantity is calculated to represent 10,192,000,000 tons of iron.

Despite the magnitude of these figures, it appears to be a fact that at the present rate of output this supply would last for less than two centuries. The present rate of output, of course, will increase almost geometrically, the demand for iron and steel products being a function of our civilization. Therefore the visible supplies of iron ore are all too meagre to meet the requirements of future generations. One evidence of this is the enormous consumption of structural steel in large buildings. Another is the fact that our mercantile marine is almost altogether built of steel.

The total iron ore output of the world in 1908 was 113,000,000 tons. The figure for 1909 was probably much larger, and the returns for 1910 will indicate a corresponding increase. Meanwhile it is interesting to note that the actual resources of the United States are estimated at four and one-half billion tons, those of Germany being calculated at 3,877,000,000 tons. The United States possible yield of metallic iron is calculated at 2,305,000,000 tons; while the German yield is only 1,360,000,000 tons of iron in an almost equivalent amount of ore. Other countries fall far behind the United States and Germany in undeveloped resources; but the United Kingdom is the principal other contributor to the reserves mentioned.

Any estimate of this kind must naturally be based upon scanty knowledge of the undeveloped resources of this continent. There is little room to doubt that we have large unimproved iron deposits. There is even less room to doubt that we have not spent a fraction of the money necessary to develop them. If we take the Lake Superior country as a criterion, then we must spend at least ten to twenty times more in prospecting than we have done. If we do this we have some hope of success. If not, we are immediately relegated to the blank background of failure.

SCOTTISH MINERAL OIL DURING 1910.

In view of probable future developments in New Brunswick, a glance at the present status of the Scottish shale-oil industry is timely. The long and successful struggle of the Scottish operators against the Standard Oil Company, a struggle of pygmies against a titan, strengthened and consolidated the former.

In earlier years the Scottish producers depended solely upon the sale of burning oil. During their fight with the Standard people, the production and marketing of vastly more valuable by-products developed rapidly.

At present the Scottish companies produce about 22,000,000 gallons of lamp oil per annum. In disposing of this large quantity there is, apparently, little difficulty. Of course the price per gallon is exceedingly low. But the strong demand for by-products compensates for this fact. And, although paraffin is being used less and less as an illuminant, as a fuel its use is growing consistently.

Amongst the important by-products, paraffin wax has suffered from competition with the American and Galician products. So also have lubricating oil and gas oil. But sulphate of ammonia, naphtha, and motor spirits have been sources of great profit. The first mentioned by-product, sulphate of ammonia, is produced to the extent of 70,000 tons per annum. When the price per ton exceeds $65, the margin of profit is substantial.

As several of the oil-shale companies pay fifty per cent. annual dividends, and others yield returns almost as large, it will be admitted that the position of the industry is strong. However, there have been numerous failures, and the success of the industry generally is directly attributable to most careful methods, constant search for new markets, and high moral courage.

We believe that the oil-shale deposits of Eastern Canada can be worked successfully. A longer period of probation may be necessary. But in situation, extent, and richness, our own deposits have many marked advantages over those of Scotland.

The tin market stands at about £180. This in itself is a very encouraging feature. But as the visible supply of tin is diminishing, there is room for the Canadian prospector to be almost unduly encouraged. Tin is really worth more than gold if you find it in sufficient quantities.

THE CROWN RESERVE REPORT.

With a total output of nearly ten million ounces of silver to its credit, the Crown Reserve mine of Cobalt has had a singularly prosperous career. During the last calendar year the mine output was 3,248,196 ounces, worth $1,757,821.27.

An analysis of the cost of silver per ounce is particularly interesting. The items of freight, treatment, smelter charges, and marketing, aggregate 3.89 cents per ounce. Head office expenses, depreciation, and insurance amount to 1.52 cents. Mining, development, ore handling and all other expenses total 6.56 cents. Thus the grand total cost per ounce of silver is 11.97 cents. Over the year the net profit per ounce was 42.13 cents, a total mine profit of $1,368,123.79. This amount, as is pointed out in the report, is equivalent to 77.34 per cent. of the value of the dividend paying stock.

The high-grade ore contained on the average 3,611 ounces per ton; the low-grade 103.5 ounces. The average of the two was 1,148.2 ounces, or $621.18.

Whilst the ore reserves are not estimated, enough general information is included to point to satisfactory conditions in the mine. Possibly it is the path of wisdom to omit close estimates; but the gap is one that demands some explanation.

It is evident that the mine will depend to a larger degree in the future upon low-grade ore. The large milling dump is being added to at the rate of 50 tons per day, mostly ore that contains about 20 ounces of silver. But the diminution in output of high-grade will be slow, if we may judge by the past.

Incidentally, the record of the Carson vein at the 100-foot and 200-foot levels is astonishing. About 6,840,000 ounces have been mined from this vein since it was opened.

The probable erection of a mill, or the placing of a milling contract with a customs concentrator, is foreshadowed in the general manager's concluding remarks.

CHANGES IN QUEBEC MINING LAWS.

Two amendments to the Quebec Mining Law are being introduced. The first of these provides that mining lands for which letters patent have been issued are sold after July, 1911, they will remain subject to a tax of ten cents an acre when they are not being worked. This corresponds to the British Columbia tax of 25 cents on unworked Crown-granted claims. It will enable the Crown to take possession anew of abandoned mining claims the owners of which are not to be found.

More important is the second amendment. This provides for a reduction of the yearly rental on mining claims under mining licenses. The present rate of $1 per acre is to be reduced to 50 cents. A qualifying clause demands 25 days' work during the first six months, and the same amount each successive year, dating from the expiry of the first six months.

Both amendments are sound. Both could be made more stringent without doing any harm to the industry. For instance we do not consider excessive a tax of one dollar an acre on unworked claims. Neither would 50 days' work annually be oppressive.

EDITORIAL NOTES.

The annual report of the Trethewey Silver-Cobalt Mine, Limited, appears just as we are going to press. We note that the net revenue for 1910 is $237,800.42 an increase of $37,992.78 over 1909. Of high-grade ore there were 155 tons produced, the average silver content ranging from 2,096 ounces per ton to 3,070 ounces. Low-grade ore to the amount of 164 tons was produced. The silver tenor of this material was 168 ounces per ton. High-grade concentrates, of which 254 tons were put out, carried an average of 1,630 ounces per ton. The average mill extraction was 86 per cent. on ore carrying 27 ounces per ton, a fine record for a new mill.

It is a remarkable fact, one that should have commercial significance, that throughout the gold mining regions of Nova Scotia, there is not a district wherein sufficient available water power does not exist to operate adequate mining work. This condition has been very largely overlooked.

OBITUARY.

George C. Tunstall died recently at Kamloops, British Columbia, after a residence in that Canadian Province of nearly half a century. He has born in New Jersey on December 5, 1836, and was educated at Sparkman's Academy, Sorel, and Lower Canada College, Montreal. When but 25 years of age he travelled west across the Canadian prairies, in company with others, now well known and honoured pioneers, arriving in British Columbia in 1862. In 1863 he proceeded to Cariboo, where for a number of years he was engaged in placer mining. In 1879 he was appointed Provincial Government agent at Kamloops, Yale district, and in 1885 received the appointment of Gold Commissioner for Granite Creek, Similkameen, where a discovery that year of coarse gold resulted in the biggest rush that district has ever seen. Five years later—in 1890—Mr. Tunstall was removed to West Kootenay district, with headquarters at Revelstoke, on the Columbia River. Subsequently he was retransferred to Kamloops, where, until 1909, he was Gold Commissioner for the northeastern portion of Yale district. Since his retirement from office his precarious health necessitated his seeking relief in change of climate, and it was only about a fortnight before his death that he returned from California. Although in his 75th year, the news of his death came as a shock to many of the friends his sterling good qualities and genial disposition had won for him during his long residence in the Kamloops district.

Microscopic Examination of some Typical Specimens of Porcupine Rocks and Vein Matter.

(Written for the CANADIAN MINING JOURNAL by JOHN STANSFIELD, Department of Geology, McGill University, Montreal.)

[Editor's Note: The following article was prepared for the CANADIAN MINING JOURNAL by Mr. John Stansfield, of the Department of Geology, McGill University. The hand specimens from which the slices were prepared were selected by the Editor, under the guidance of Mr. Myles Flynn, through whose kindness it was possible to secure a representative lot. All the specimens were taken from the Vipond mine, largely for the reason that on this claim nearly all the characteristic types of ore and country rock are to be found within small compass.

Whilst each microphotograph has its own particular significance, the general conclusions adduced by Mr. Stansfield are noteworthy. That the carbonates are older than the quartz is demonstrated. That the quartz is of igneous origin is indicated. The presence of feldspar shows a relation of the vein matter to aplite, and, as Mr. Stansfield points out, the presence of tourmaline tends to confirm the idea of the igneous origin of the vein matter.

Another fact adduced may be of decided moment. The gold and pyrites were evidently of contemporaneous origin, although some of the gold was deposited at a period later than the pyrites.

We hope that the article will arouse discussion, and that our Porcupine readers will send in comments freely. The co-ordination of facts observed in the field and in practical work, with conclusions drawn from laboratory research, is of the highest importance. Therefore we particularly request comment upon the material presented herewith.]

Pure Ankerite, No. 2 Vein.

A dark, bluish gray quartz band, bearing pyrites, cutting a dark brown carbonate, stained by limonite. The carbonate is siderite, bearing traces of calcium and magnesium. By weathering it is partly altered to limonite. The quartz vein is accompanied by a vein of ankerite. A slice of the quartz-ankerite vein shows dirty carbonate—the ankerite cut by thin veins of clear carbonate, and also by veins of coarsely and finely granular quartz, which has liquid inclusions containing gas bubbles. The carbonate is also found scattered through the quartz veins, but especially at their edges. A few crystals of pyrites occur in the ankerite and often have a little quartz in contact with them.

A slice of the dark brown carbonate shows yellow siderite cut by a vein of quartz. The quartz is usually coarse in grain and full of liquid inclusions, which have gas bubbles, some of them being in motion. The quartz contains some of the siderite in a clouded condition. Some of the quartz grains have a slight chloritic film round them. The siderite is finely granular and towards the quartz vein becomes more and more clouded with a fine dark brown dust, becoming almost opaque at the edge of the vein. The clouding is due to the production of limonite, which appears to be directly connected with the introduction of the quartz vein. Some small quartz grains are found distributed through the siderite.

No. 3 Footwall Pay Streak—Pit 300 Feet East of Ward Pit.

See Fig. I.

White quartz with dark green richly pyritic bands, some narrow bands rusted and showing free gold. Some surfaces show chlorite-sericite schist development.

The mass of the rock is quartz which is shot through in all directions by carbonates and fine-grained quartz and also by more definite veins characterized by fine-grained quartz, pyrites, chlorite and sericite. The

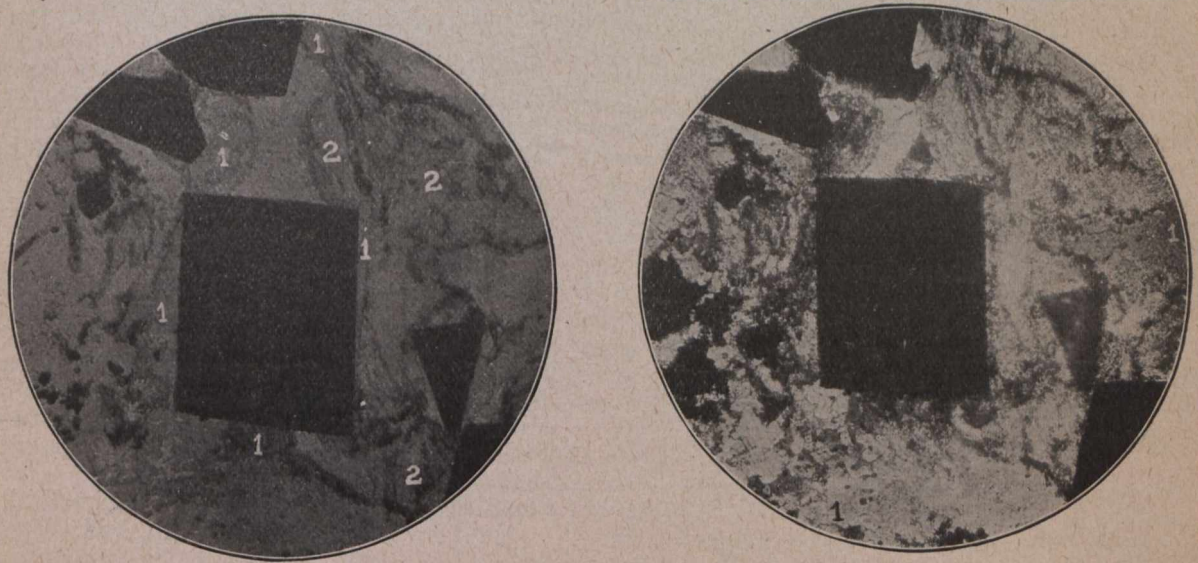


Fig. I.

1. Chlorite. 2. Sericite. Nicols. 1. Quartz.

Shows films of chlorite wrapping round pyrites crystals in a rim of sericite in quartz.

sericite and chlorite are usually seen wrapped round the pyrites crystals, which are large and well-shaped. The carbonates are dirty and are often iron-stained. The quartz grains sometimes have films of chlorite between them and chlorite is seen through the slice outside the veins, but in small amount only.

Vein Matter—Green is Characteristic of Whole District, Only Associated With Carbonates.

See Fig. II.

Gray banded rock, bands of bright green often associated with pyrites, bands of yellow carbonate and bands of quartz. Some surfaces are slimy, suggesting sericite.

The rock is rich in carbonate and in quartz. Pyrites in large irregular masses is developed along bands. The

Tourmaline needles of a bluish gray or brownish gray colour are found with arrangement in strings parallel to their length.

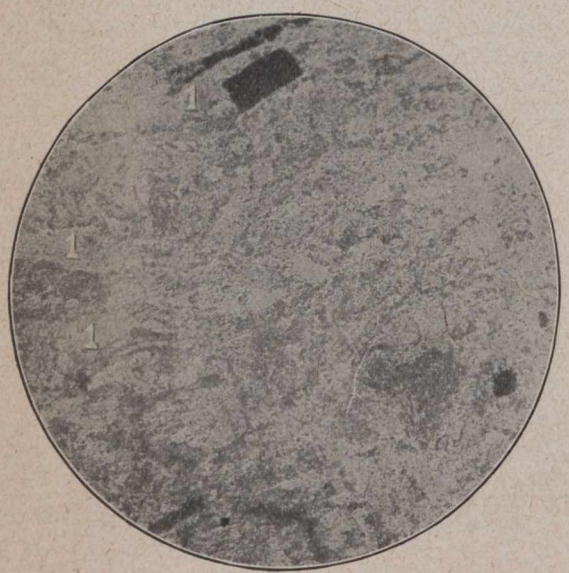
A few small patches of gold occur in association with interstitial carbonate and one small crystal of pyrites with interstitial carbonate, chlorite, iron oxide, the latter produced by weathering.

The green is chlorite and tourmaline with a predominance of the former.

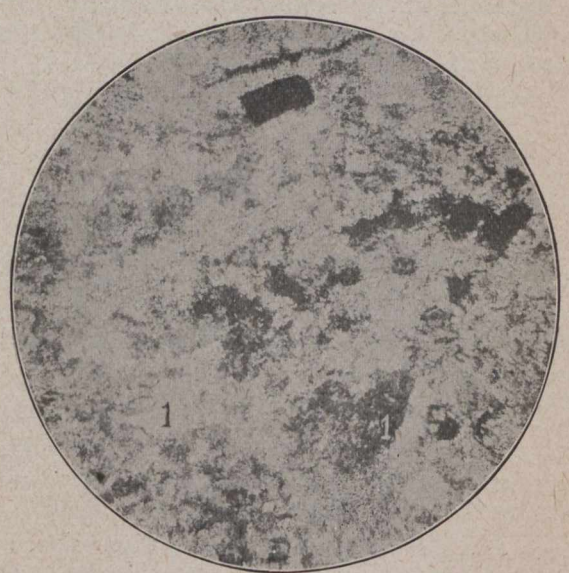
No. 3 Vein—Banded Smoky Quartz—Ward Pit West.

See Fig. III.

Quartz rock with darker and lighter bands and thin bands rich in pyrites, with some softer talcose bands. The hand-specimen shows considerable free gold, which



1. Sericite Bands.



Nicols. 1 Twinned Feldspar

Fig. II.
Shows development of sericite bands in quartz. Two feldspar crystals (oligoclase) are shown. The dark line shows its upper boundary.

green matter is chlorite which is developed along bands and always associated with sericite in greater or less quantity. The chlorite shows a slight pleochroism, from green to yellow. A considerable quantity of feldspar occurs, including both orthoclase, with twinning on the Carlsbad law, but more frequently plagioclase, twinned according to the albite law, and some laths untwinned. The plagioclase is of a basic oliogoclase variety. (Extinction angle 16 deg.)

The rock appears to be an altered igneous rock which has been impregnated in all directions by carbonate and quartz. It would appear to have been originally of the nature of an aplite. There is nothing to indicate what was the original mineral from which the chlorite is formed. The sericite, at any rate in part, is derived from feldspar.

Green for Identification.

White quartz with green patches. The pyrites occurs in small amount in the green patches. It is now much altered, giving rise to brown iron-staining. A little free gold seen at one point on one of the green veins.

The rock consists of quartz in coarse grains showing strain shadows and very many liquid and gas inclusions. Five grains occur only in very small amount. Carbonates occur as interstitial patches and as thin films between quartz grains. Chlorite occurs interstitially usually associated with carbonates. It has a faint greenish colour with very faint pleochroism and is nearly isotropic.

always occurs in connection with the pyrites bands, but just outside them.

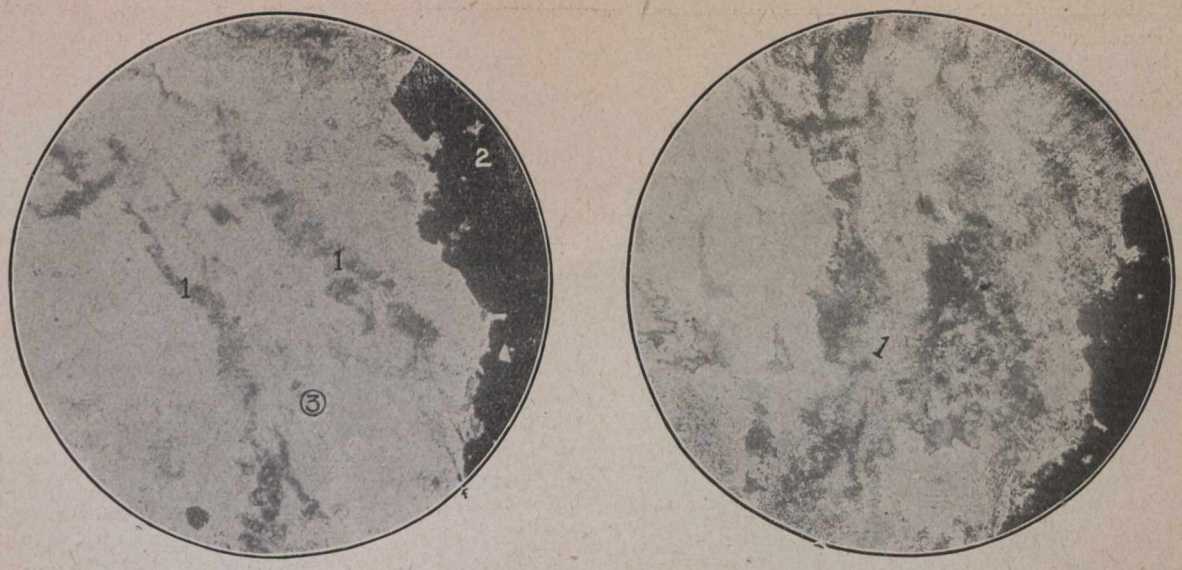
The rock is made up of quartz for the main part, which occurs in coarse and fine grains, chiefly the latter. Some of the grains are elongated and placed with their lengths perpendicular to the faces of pyrite crystals, which often exhibit this phenomenon on all four faces, which are seen in the slice. The quartz is full of liquid inclusions, usually with a gas bubble inside the liquid. The larger grains show strain shadows. Pyrites in large irregular masses is developed along bands, as are also sericite, carbonate and tourmaline. The tourmaline occurs in small pleochroic needles and is only small in amount. Sericite is more important in amount and forms streaks through the quartz often with no other mineral in it, in other places associated with quartz and carbonates. Carbonate is found scattered throughout the rock.

No. 2 Vein—Banded Quartz and Schist With Sulphides —Fairly Rich in Gold.

See Fig. IV.

A dark-coloured banded quartz-chlorite schist, the quartz and chloritic bands being very distinct. Contains a little pyrites. A fresh fracture shows the greenish colour of the chlorite.

Section shows banded structure and consists of quartz, carbonate, chlorite, sericite, pyrites, and a little tourmaline, in that order of importance. The minerals are arranged in bands and various associations are



1. Tourmaline Bank. 2. Pyrites. 3. Sericite Bank. Fig. III. Nicols. 1. Sericite.
Shows parallel development tourmaline bands on each side of a sericite band, and of pyrites.

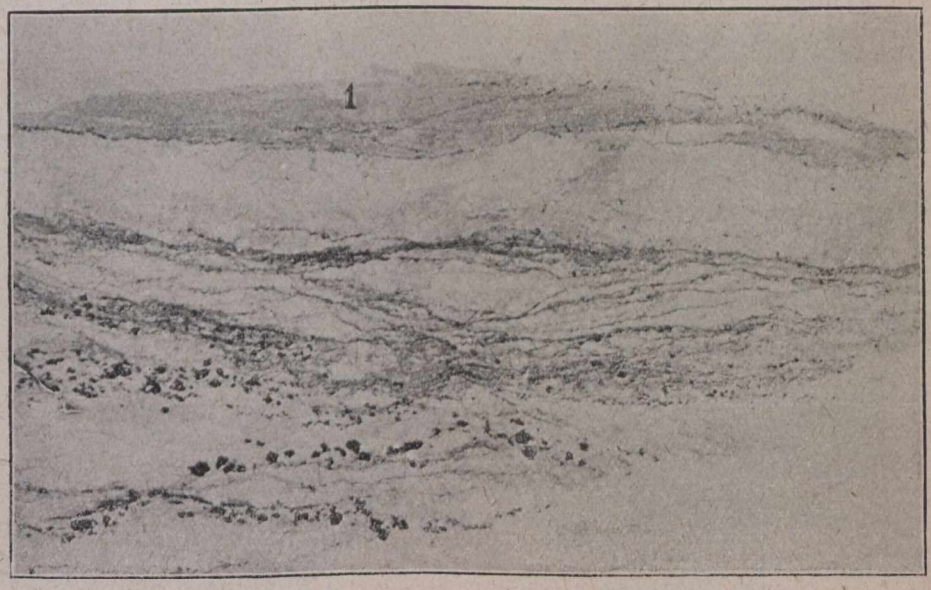


Fig. IV. 1. Carbonate Band. Shows Banded schistose structure with pyrites in bands. The dark streaks are rich in chlorite, the lighter ones in carbonate.

found, e.g., bands of sericite with tourmaline, of chlorite and sericite, with or without pyrites, of quartz with no other mineral, and so on. The quartz occurs as eyes and is finely granular. Carbonate is found scattered throughout the rock in addition to its parallel arrangement in bands.

The chlorite is in places of a deep green colour for chlorite, and at the same time with more marked pleochroism, from green to yellow, with low birefringence and extinction parallel to the lengths of the fibres.

Mixed Sulphide and Ankerite From No. 3 Vein—Gold-Bearing.

See Fig. V.

A gray carbonate rock with much quartz and very rich in pyrites. In some parts it has bands of a talcose schist.

The rock is composed of dirty carbonate in which pyrites is very richly disseminated. It is usually accompanied by quartz which is also scattered through the carbonate. There are quartz veins cutting the carbonate. The pyrites often has good crystal outlines, but also ragged outlines. The quartz veins are not rich in pyrites, but the largest crystals occur there. The quartz crystallized in contact with pyrites often shows elongated shapes, the grains being set with their length perpendicular to the faces of the pyrites crystal. The quartz is rich in liquid inclusions, which often have a gas inclusion in them. A small quantity of sericite occurs and is generally found in association with the quartz-pyrites nests, often in direct contact with the pyrites. One small piece of green chlorite occurs surrounding a small crystal of pyrites.

No free gold occurs in the slice.

One or two crystals of the feldspar occur in the calcite. It is an oligoclase showing an extension angle of 12 deg.

Fig. V.
Veins of quartz cutting carbonate, with rich development of pyrites in carbonate. Largest pyrites crystals are in quartz vein.

and chlorite indifferently, most often as a dirty dust.

Black Dolomite From No. 2 Vein Footwall.

A black carbonate rock with siliceous appearance. It has small bands with development of sericite schist.

The rock is composed of carbonate with a very little quartz in small interstitial grains.

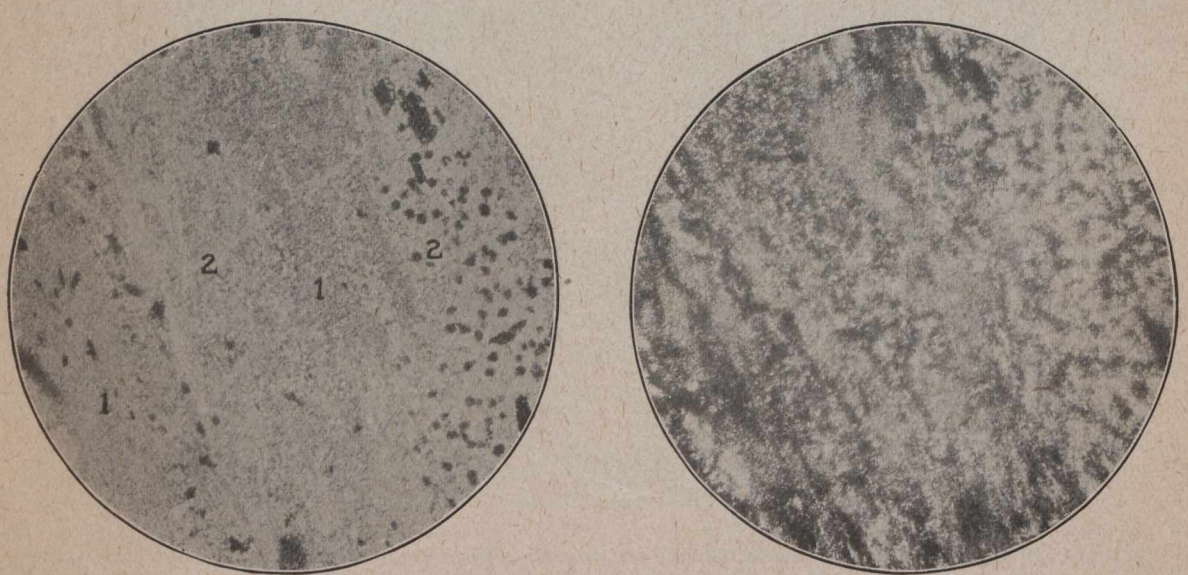
The carbonate is for the most part finely granular, some bands showing very coarse grain. The whole rock shows banded structure which is marked by small bands of fine opaque dust, or by difference in the size of the grains.

The structure indicates considerable movement since the formation of the carbonate. The occurrence of coarse-grained patches along one of the bands confirms this. At one part this shows intense crumpling and folding on a small scale with granulation of large crystals of carbonate.

Characteristic of No. 3 Vein—Constitutes From One-third to One-quarter of Vein Matter.

See Fig. VII.

A banded rock rich in quartz consisting of pure quartz bands and other bands containing sericite, some of which are very rich in pyrites. It consists for the most part of granular quartz, the grains being of two sizes, coarse and fine grains. Strain-shadows in the larger grains indicate strains due to differential pressure subsequent to the formation of the veins. All the



1. Green Chlorite. 2. Colorless chlorite. Fig. VI. Nicols
Shows banding of chlorite schist and occurance of opaque dirty patches.

Fine and Coarse Amygdaloidal Basalt.

See Fig. VI.

A dark green rock approaching a chlorite schist. It has well-marked parallel structure and has elongated amygdales which are filled with carbonates.

The rock is composed of chlorite and carbonate. The carbonate fills up the elongated amygdales, passing into bands. The chlorite is banded and of two varieties, one almost colourless and the other deep green with strong pleochroism (olive green to greenish yellow), and with higher birefringence than is usual in chlorite. It corresponds in characters to clinochlore. The bands are characterized by varying amounts of the two varieties of chlorite and also by sericite, which is also found in bands, but in subordinate amount.

The rock is rich in dark patches of indeterminable matter, in some cases quite opaque, by white or reflected light. It has rough shapes and occurs in the calcite quartz is rich in liquid inclusions, which usually have a gas bubble inside them. Carbonate is distributed through the slice in considerable amount. The work has a banded structure, the bands being marked by the development of tourmaline, pyrites, carbonate and sericite, sometimes some of the components being absent. The tourmaline occurs in small needles, colourless or greenish-brown, with a distinct pleochroism.

The needles have parallel arrangement along the direction of the banding.

The pyrites occurs in small crystals and less often in large patches with irregular shapes, in the veins.

Sericite is found in certain of the bands being associated with tourmaline.

A very little green chlorite occurs in the veins and just outside them. There is also a certain amount of opaque indeterminable matter in the bands.

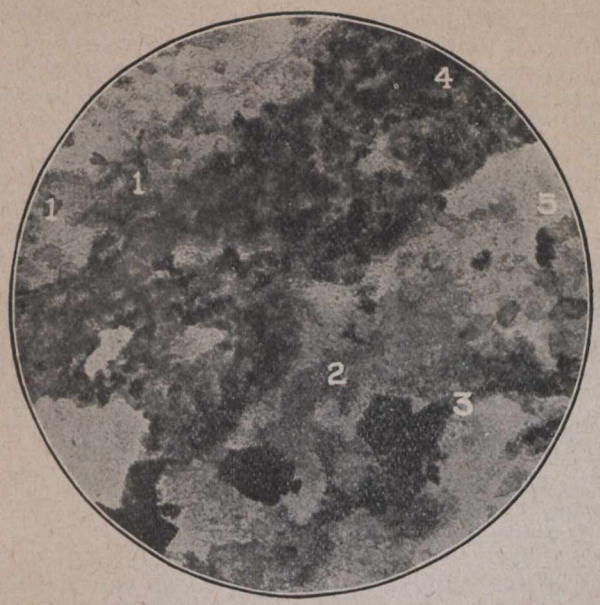


Fig. VII. 1. Carbonate in quartz. 2. Chlorate. 3. Tourmaline. 4. Tourmaline with pyrites. 5. Quartz with carbonate. Shows a tourmaline band rich in pyrites with large crystals along parallel band.

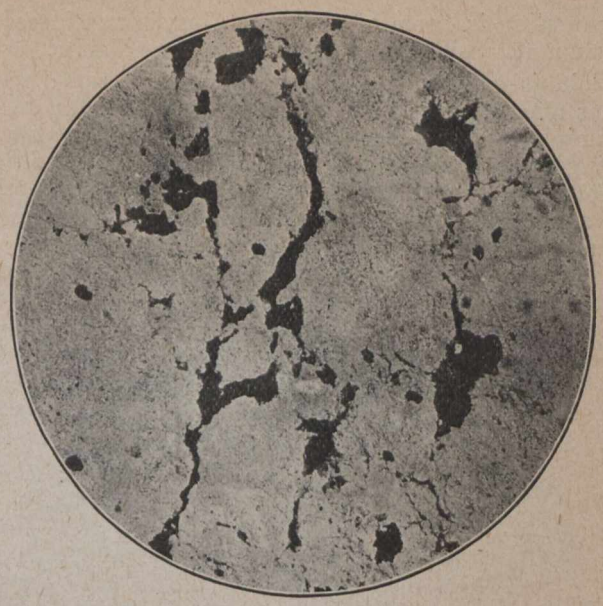


Fig. VIII. Stringers of gold in coarsely crystalline quartz.

Nicols

Fig. IX. 1. Carbonate.
Pyrites and gold in quartz carbonate vein, Pyrites wrapped round by gold. Quartz finely granular.

Surface No. 3—300 Feet East of Ward—(Deep Pit). See Fig. VIII.

A brown stained, honey-combed quartz gossan with a considerable amount of free gold showing.

The rock is an almost pure quartz of very coarse grain, but with small interstitial granules. The quartz is full of liquid-gas inclusions. Brown stains of iron oxide are common between adjacent grains.

A little interstitial chalybite or iron-stained carbonate occurs and is often very dirty.

Gold occurs in considerable quantity either in stringers in the quartz or in specks and stringers with dirty carbonate in the quartz. Only a very few crystals of pyrites occur with dirty carbonate. One such crystal has gold partly wrapped round it.

One small patch of chlorite occurs.

A few crystals of feldspar are scattered through the rock. They are of a basic oligoclase (extension angle 16 degrees and optically negative) and show albite twinning.

The occurrence of feldspar suggests affinities to an aplite vein.

No. 3—Smoky Streak—on Footwall at Pit 200 Feet E. See Fig. IX.

Banded quartz with dark bands rich in pyrites. Free gold, chiefly in the clear quartz just outside the dark bands.

The rock consists of quartz and carbonate, the former predominating. The quartz occurs as coarse and fine grains, chiefly the latter. The large grains show strain shadows. Inclusions of liquid and gas are very numerous.

Veins of pyrites associated with tourmaline quartz and carbonate run through the rock, the tourmaline in parallel needles and the pyrites in good crystals, but chiefly in irregular bunches of crystals, is present in large amount. A little sericite is found along with

tourmaline in some of the veins, but is not important in amount. Still less abundant is green chlorite.

Gold is associated with the pyrites in some of the veins and its relation to the pyrites is brought out by examination by reflected light. The gold occurs in stringers and small specks in the vein and in addition is found in contact with pyrites, being always deposited on a crystal face of the pyrites, or partly wrapped round the crystal.

Most of the gold occurs in irregular bunches and only a few individuals show crystal shape.

Fig. X 1. Pyrites. 2. Gold Stringer. 3. Opaque calcite. 4. Tourmaline needles. Parallel band of Tourmaline needles and stringer of gold in quartz. Crystals of pyrites.

A little distance from the vein at one point small pyrites crystals and small gold particles occur along parallel cracks, their appearance suggesting contemporaneous deposition.

Opaque indeterminable matter occurs in some bands.

No. 3 Centre of Vein—Deep Pit at Bottom—Green to be Identified.

See Fix. X.

A white quartz with green bunches and streaks rich in pyrites and with free gold showing at the edges of the patches and outside the edges of the veins.

A quartz vein with a fair amount of interstitial carbonate. The quartz grains are both coarse and fine, chiefly the former, and showing strain shadows and very many liquid inclusions with gas bubbles. The carbonate, in addition to forming a cement, in many parts of the rock is seen running in straight and narrow veins straight through quartz grains. A little sericite is found associated with the interstitial carbonate.

Pyrites, carbonate, and a few small tourmaline needles of a greenish-gray colour are developed together, occasionally with a very little sericite and chlorite. Tourmaline needles are seen penetrating quartz grains.

A little gold occurs as ragged patches, stringers, and wires just outside the tourmaline bearing veins, a roughly parallel arrangement of gold and tourmaline bands being seen at one point.

No. 3.—Centre.

See Fig. XI.

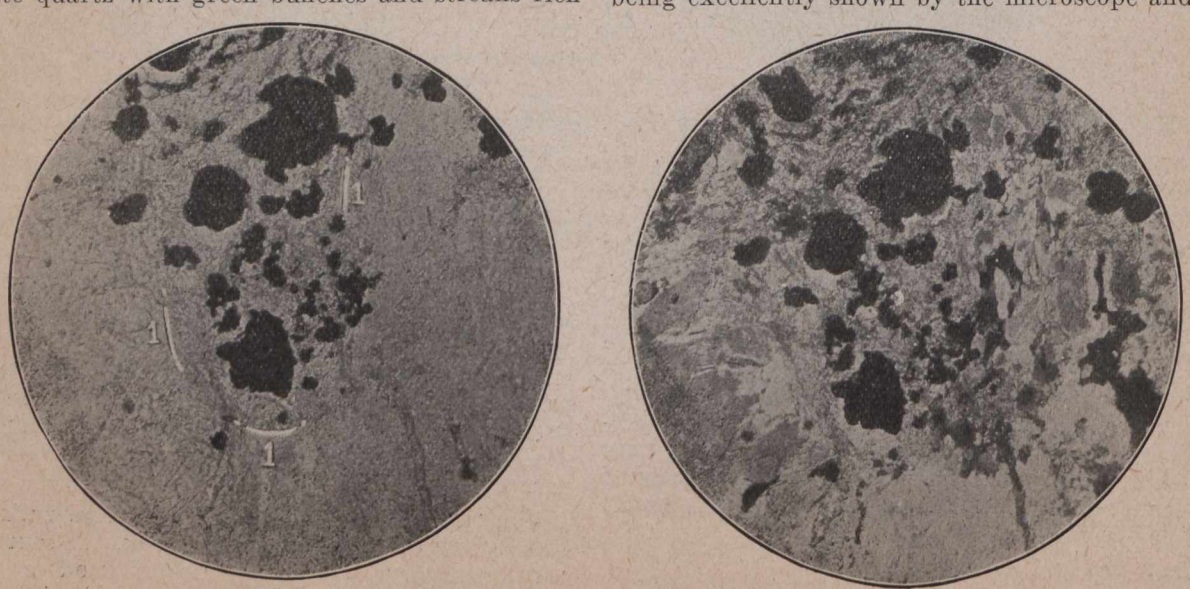
A white quartz with green bunches and streaks rich in pyrites and with free gold showing at the edges of the green patches, or just outside and closely associated with the streaks.

The rock is composed of quartz and a large amount of silicate, and some carbonate. The quartz is of both coarse and fine grain, the former showing strain shadows, and liquid inclusions containing gas bubbles are found in both. The sericite is developed in bands which are very rich in pyrites. Tourmaline is found along with the sericite, but only in small amount. It has the usual development in small needles. Chlorite occurs in the sericite bands and the carbonate is found in the bands too.

The pyrites is usually in large crystals and aggregates, sometimes in small crystals. It is very abundant. A little free gold is seen distributed in little specks through the veins, among the pyrites, and at one point it is seen wrapping round pyrites.

Conclusions.

The general relations of the quartz veins and carbonate veins point to the greater age of the latter. For the most part the quartz veins cut the carbonate veins, this being excellently shown by the microscope and only in



1. Boundaries of sericite Patch or tongue. Fig. XI. Nicols.
Shows very rich development of pyrites in sericite vein cutting quartz.

rare cases there are small veinlets of carbonate cutting through several quartz grains and hence formed after the quartz. The general distribution of the carbonate through the quartz rocks is to be accounted for by solvent action of the waters which caused the deposition of the quartz giving rise to contemporaneous formation of quartz and the carbonate found with it, and in part to solvent action of percolating waters and deposition subsequent to the formation of the quartz.

The nature of the quartz, its granular form and richness in liquid and gas inclusions, point to an igneous origin, or, at any rate, to deposition from hot solutions rich in gases. Conditions requisite for the formation of quartz with these characters are such as exist in the final stages of intrusive activity. The existence of feldspar in some of the slices shows a relation of the vein matter to aplite, and the presence of tourmaline adds weight to the idea of an igneous origin of the vein matter.

The later stages of intrusion of a granitic magma are characterized by the injection of pegmatite and aplite veins, with a progressively increasing acidity. The final stage of such an increasing acidity would be quartz and the more volatile and more soluble constituents of the original magma would be concentrated in this residual quartz.

The products of these final stages are quartz veins characterized by such volatile and more soluble constituents as well as those of a low melting point, which are immiscible with the general magma. Such constituents are gases, water, boron-rich and fluorine-rich minerals, tinstone, pyrites, gold, and so on.

Of these, gases, water, tourmaline, pyrites, and gold are widely distributed in these rocks from the Porcupine district, and afford evidence sufficient for the conclusion to be arrived at that these rocks are connected with an intrusion, probably of a granitic character, without having direct field evidence of the same.

The problem of the relation of the gold to the pyrites and the time of deposition of the gold does not receive very clear solution from examination of rock slices. But such evidence as is obtainable points to the fact that the pyrites and gold were roughly contemporaneous in deposition and that the gold to some extent was deposited at a slightly later time than the pyrites round which it wraps itself. Some slices show specks of gold scattered through a vein rich in pyrites, of which the appearance is that of being formed wholly at one time.

Subsequent enrichment in the gossan and oxidation of pyrites leaving a quartz rock rich in gold is similar to that found in very many cases of mineral veins.

The character of the quartz indicates considerable movement in the district, or at any rate earth-pressure of some magnitude, giving rise to "strain-shadows" in the large grains of quartz and to fine granulation of the same along junction planes between adjacent grains. Granulation may affect whole bands in some instances. The same evidence of earth-stresses is afforded by the country-rock, the chloritic schists, and by the dolomitic vein filling, by its banded and granulated structure, some large crystals showing progressive stages of granulation. Folding, also, of bands of the dolomite indicate the same origin.

That there has been considerable movement in these rocks cannot be doubted, but the condition of the quartz indicates that some part of it took place subsequent to the formation and filling of the veins.

ABSTRACT OF PRELIMINARY REPORT ON THE MINERAL RESOURCES OF THE CHIBOUGAMOU REGION.

(Continued From Last Issue.)

GENERAL PHYSICAL FEATURES:

The expression "Chibougamou Mining District," or preferably "Region," was applied as a term of convenient reference soon after the more recent discoveries of mineral in 1903 to designate that particular tract of country immediately surrounding Lake Chibougamou. The term "region" is the better in order to avoid the confusion with other areas in Northern Quebec, to which the term "district" has been applied, and which have thus been set apart officially to denote some of the larger land subdivisions of the province.

Strictly speaking, it is confined to the area shown on the map, which accompanies this preliminary report. It thus reaches from the Bay of Islands, the eastern extension of Lake Chibougamou, to Assinitchibastat on the West; while a line drawn from east to west about a mile north of McKenzie Bay, would mark the northern limit and a similar line cutting through Long Point (the termination of Devlin Peninsula), would constitute the southern boundary. Such an area would embrace 253 square miles.

As the region under description is situated immediately north of the height of land near the summit of the Hudson Bay slope, it has a certain general flatness of topography which is characteristic of most of our hinterland similarly situated. The general character of the country may, perhaps, be best described as that of an uneven or undulating rocky tableland with a gentle slope toward the west and northwest. The average general elevation varies from 1,100 to 1,500 feet above the sea. Few of the rounded rocky hills have more of an elevation than about 50 feet, while the complementary valleys are occupied by swamps and lakes and rivers. Low swampy shore lines are very extensive and characteristic.

Perhaps the most striking features in the landscape are the hills (or mountains) which characterize a strip of very rugged country varying in width from 5 to 6 miles and which extends across the whole of the region covered by the present map from north of Island Bay to Assinitchibastat Lake. In this direction the hills become more isolated, especially to the west of Assinitchibastat Lake, although they seem to extend as far as Opemiska and Mikwasach Lakes.

These hills have a general elevation varying from 300 to 600 feet. The highest is Cumming Mountain to the west of McKenzie Bay, which rises to a height of 625 feet above Chibougamou Lake. Juggler Mountain has

a height of 560 feet, while Sorcerer Mountain rises 575 feet above Chibougamou Lake.

In agreement with the lower ridges they have a general trend from east-northeast to west-southwest and are usually sharply conical in outline.

Near the outlet of Wakonichi Lake the Lower Huronian conglomerate forms a series of steeply scarped hills, which generally, with flat tops, rise from 300 to 625 feet above the lake, the last mentioned elevation being that of the highest, Wako Mountain. To the southwest, in the granite area, other hills were noticed, but they are somewhat lower and more regular, being for the most part separated from one another by wider stretches of level country. Bouleau Mountain, 485 feet on the west side of the lake, is the highest.

DRAINAGE:

The greater part of the region under description is drained by the Chibougamou River and its tributaries, which, flowing in a general westerly direction, empties into the Waswanipi branch of the Nottaway River at its junction with the Obatogamau River, finally reaching Rupert Bay, the southeastern extremity of James Bay. The Chibougamou forms the outlet of Chibougamou, Dore, David, Cache, Bourbeau, Assinitchibastat and Gwillim Lakes. The waters of the northeastern part of the sheet drain into Wakonichi Lake, which also finds its way into Rupert Bay by way of Mistassini Lake and the Rupert River, the mouths of the Nottaway and Rupert Rivers being within a few miles of one another. With the exception of the Chibougamou River towards the northwestern corner of the map, none of the streams are large, but they are almost without exception easily navigable for canoes practically to their sources. They all form portions of canoe routes, which without any great length of portages reach almost any part of the district.

LAKES:

In common with other regions characterized by the presence of Archæan rocks, the region is remarkable for the number of lakes, both large and small, which are scattered over its surface. These are noteworthy for the intricacy of their shore lines, while some of them, as Lakes Simon and David and the central portion of Lakes Dore and Chibougamou, contain a great number of islands varying in size from mere rocks to some which are several square miles in extent and complex in form.

The following are the principal lakes with their areas:

Lake Chibougamou, 87.35 square miles.
Lake Wakonichi, 31.54 square miles.
Lake aux Dores, 16.89 square miles.
Lake Assinitchibastat, 5.32 square miles.
Lake David, 4.76 square miles.
Lake Simon, 4.60 square miles.
Lake Bourbeau, 2.73 square miles.
Lake Gwillim, 2.48 square miles.
Lake Cache, 1.41 square miles.

SOIL:

As a rule there is a very scanty covering of soil, and over large areas the glaciated rocks are directly overlaid by the peat and moss. In places, however, there is a considerable covering of glacial till mixed with boulders. The till is decidedly sandy in its composition with very little clay admixture. It has very little fertility as a rule. Along the sides of the river valleys this unmodified drift has been re-arranged and is much fined and considerably more fertile, but even such areas are by no means desirable as farming lands, even if the climatic conditions were more favourable.

CLIMATE:

The climate of the Chibougamou region cannot be very different from that of Mistassini. For many years, until his superannuation about five years ago, Mr. William Miller, the officer-in-charge, took certain meteorological observations, mainly as to the temperature, his observations being taken thrice daily, at 8 a.m., 2 p.m. and 8 p.m. He also made notes as to the days on which snow and rain fell and also at times made mention as to the amounts of cloud present in the sky in the usual comparative terms adopted, 10 denoting fully overcast, while 0 denotes clear. These observations have, no doubt, been forwarded to the meteorological office at Toronto, but Mr. Bateman made copies of some of them, which have been left by Mr. Miller, and from these the following generalized table has been prepared. Although incomplete, it will serve to give a good idea of the prevailing temperature at Mistassini, which is very little different from that prevailing at Chibougamou (about 40 miles S. S.W..).

Temperature at Hudson's Bay Co.'s Post.

LAKE MISTASSINI, QUEBEC.

(By W. Miller, Officer-in-Charge till 1905).

	1901 Jan.	1889 Jan.	1901 Feb.	Feb.	Mch.	Apr.	May
Mean Temperature—	12.6	2.43	—12.3	2.07	20.5	32.2	44.3
Highest Temperature—	20	37	40	30	40	55	77
Lowest Temperature—	—41	—35	—33	—41	—09	—08	—25

	June 1889	July 1889	Aug. 1885	Sept.	Oct. 1900	Nov. 1900	Dec. 1900
Mean Temperature—	54.6	61.4	56.7		35.7	12.5	—02
Highest Temperature—	85	87	81		57	45	14
Lowest Temperature—	30	41	31		15	—22	—40

In comparison with these we may cite the mean temperatures of Ottawa, Montreal and Quebec for the twelve months of 1885, as shown in the following tables taken from Mr. O'Sullivan's report on exploration of country between Lake St. John and James Bay. These are given on the authority of the Government Meteorological Office, Toronto:

	Jan.	Feb.	Mch.	April	May	June
Quebec	7.8	6.6	11.8	35.9	51.9	59.8
Montreal	12.1	5.9	13.2	37.7	55.4	62.1
Ottawa	12.0	4.4	12.3	36.2	55.3	63.1

	July	Aug.	Sept.	Oct.	Nov.	Dec.
Quebec	66.5	51.6	52.9	42.3	31.0	16.2
Montreal	69.2	63.0	55.4	44.1	32.8	19.4
Ottawa	69.4	62.4	54.9	43.9	32.8	17.5

It was reported to us that the ice takes firmly on the lake near Mistassini Post about the end of the first week in November, and does not break up until the end of the first week in June.

During the month of June, while on the way to Chibougamou, we experienced frost on several nights, the last one occurring on June 29th, at the height of land between Obatogamou and Chibougamou Lakes, after which date until the night of August 14th (at Mistassini Post) no frost was noted. At this time the frost was only a light one and did not injure the potatoes, but a heavy frost during the night of August 18th must have completely frozen the tops.

The rapid changes in the season seem most remarkable. There is practically no spring and very little autumn weather as we understand it in the vicinity of Montreal. Thus, up to the end of the first week in September, the leaves of the deciduous trees were remarkably green, but at this period and in two days' time they had completely changed colour, assuming their

full autumn tints. The advent of spring is equally rapid, for usually the end of the first week in June sees the disappearance of the snow from the ground and the ice from the lakes while the trees burst into full foliage in the space of only a few days. On fine days when not fouled by smoke from forest fires, the atmosphere is remarkably clear and one is enabled to see mountains quite distinctly which are from 30 to 40 miles distant. This remarkable clearness of the atmosphere is shown in many of the photographs taken from the tops of the various mountains.

It is to be regretted that no measurements were made of the rainfall, and although it may not, perhaps, be extreme, it is very constant and hardly one whole day a week passes without either a continual drizzle or showers. Thunderstorms were not very frequent, but they occurred at intervals even during very cool weather. That the climate is usually moist during the summer months is evidenced by the rank growths of moss and Labrador tea. The temperature is dependent on the wind and a calm day was very rare during our sojourn at the lake. Steady rain usually came with southeast, south or even southwest winds. The west and northwest winds brought decidedly cool, but clear weather; north and northwest winds usually bring heavy winds and showery weather, while an east wind very often was a sign of fine weather until it turned towards the southeast, when rain almost invariably followed.

At Mistassini Post they seemed to experience great difficulty in raising a comparatively small crop of potatoes and so no other vegetable is attempted. At the time of our visit (August 14), the potatoes were in flower with a luxuriant growth above ground, but the large potatoes themselves were only from 3 to 4 inches in their longer diameter.

The average temperature for the three summer months is probably a little less than 58 degrees F., and the heavy frosts, even late in June and about the middle of August, retard the growth, so that the tops are blackened and killed before the potatoes ripen. It is, however, beginning to be recognized that climate is extremely local and is dependent on a great many factors for a long time not fully understood or appreciated. One authority has stated that it is almost as easy to regulate the climate within certain limitations in a given district as it is to control the temperature of any residence. Thus it would seem entirely reasonable that the clearing up of a much larger area in the vicinity of Mistassini post would doubtless help to ameliorate the present severe conditions. The soil appears to be sufficiently fertile, so that in an additional two or three weeks without severe frosts, the potatoes would ripen so fully as to enable them to be kept through the greater part of the winter at least.

An abundant supply of this vegetable would greatly improve the present condition of the Indians who choose to make the interior of Labrador their home, and who, without any knowledge or wish of bettering their lot, will still continue it as their place of residence.

There can, however, be no doubt that the settlement of even the comparatively fertile slopes of Mistassini for purposes of agriculture is by no means encouraging when there are such wide areas elsewhere in Northern Quebec far more suitable for such purposes.

THE NATIVE INHABITANTS:

The Indians who hunt in this district belong chiefly to the Mistassini band, although occasionally some of those residing at Waswanipi to the west or some of the Montagnais from Pointe Bleue on Lake St. John pay a visit to this district for hunting purposes. The Mistassini band belong to the Nascaupee tribe, who are a branch of the Swampy Crees. They have been converted by the missionaries of the Church of England. A lay reader, a brother of the Hudson Bay Company's agent, is their spiritual adviser. There are about thirty heads of families and the whole band numbers about 160.

ANIMALS:

There were no signs of any of the larger animals belonging of the deer tribe, although five moose were reported as having been shot two years ago to the southeast by the Hudson Bay Company's Post at Lake Mistassini. The chief fur-bearing animals are the otter, mink, marten, beaver and muskrat. The Chibougamou region seems especially suitable as a place of residence for these valuable animals and with a little care and protection they could be greatly increased in numbers. Of the larger animals the Black Bear is very abundant especially in the region surrounding Sorcerer Mountain, but signs of his presence were noticed almost anywhere while travelling through the woods.

Ducks are, as a rule, comparatively scarce throughout the region, although there are very notable exceptions to this rule as on Rush Lake where they are very abundant (especially the black duck).

The merganser or saw-bill and a species of diver are also commonly met with. The great northern diver or loon is a usual inhabitant of the lakes and very large and beautiful specimens were seen, but they are by no means as abundant as further south. Both large and small gulls were seen, two of their favourite nesting places being on rocky islets in the large western bay of Lac Dore, and among the islands in the centre of Chibougamou Lake.

The osprey or fish hawk was also very often seen making its nest not far from the water and on the top of some of the larger white spruces. Partridges were by no means abundant during the past summer.

FISHERIES:

The fishing in all of the larger lakes is remarkably good and on account of the prevailing cold water even in midsummer most of the species are firm and palatable.

The most desirable food fishes are lake trout, brook trout, whitefish and pickerel, with an occasional maskinonge. Sturgeon occurs on the Obatogamau River and its tributaries, but has not been found in the lakes immediately surrounding Chibougamou. The lake trout grows to a very large size in Chibougamou and Wakonichi Lakes, being especially plentiful and of excellent quality in the latter lake. Brook trout is especially plentiful and of large size (4-6 lbs.) in Chibougamou, Wakonichi and on the Rapid River. Whitefish from 4 to 6 lbs. in weight and of good quality are found in almost all the lakes. Pike and pickerel often from 8 to 10 lbs. in weight abound in all of the lakes, but especially in Dore Lake. Suckers of two or three varieties and often of very large size are abundant in all of the waters.

TREES:

The black spruce is by far the most abundant of this sub-arctic forest and constitutes probably more than three-fourths of the forest growth. It is most abundant in the valleys and lower levels and often forms a very dense growth of small trees. Along the side of hills and even on the summits of the mountains where the boulder clay is found, the growth is considerably larger and many of the trees in this situation would cut into logs eight or ten inches in diameter and occasionally

even this size is slightly exceeded. It is stated that even trees of four inches in diameter are suitable for pulp wood, so that in this case there would be a large supply for this purpose, especially from the mouth of Nikabau northwards. The proportion of logs suitable for lumber seems to us too insignificant to receive very serious attention.

White spruce was noticed but is by no means abundant, but it is very often met with on the sides and summits of ridges where the boulder clay is present. Some of them growing near Bourbeau and Dufault Lakes varied from 16-22 inches in diameter. Such areas, however, are limited to the rough country extending from north of Island Bay to Assinitchibastat Lakes (25 miles, with a width of about 5 miles. In such favourable situations there would be in certain places probably enough for lumbering purposes if the district were not so remote.

Cedar was not observed on the Ashuapmuchuan River, nor even on the Chigobiche until within a comparatively short distance of Chigobiche Lake. In the Chibougamou region, however, it is abundant along the edges of the lakes and streams. Although sometimes of comparatively large diameter near the base it is stunted in its growth and is of little use. The biggest tree noticed (outlet of Lake Bourbeau) measured 9 feet in circumference at the base, and was only about 30 feet high. (The Indians at Mistassini used balsam for the ribs of their canoes as they cannot get suitable cedar). Aspen is abundant on the drier hillsides, especially over recently burnt areas, and some of the trees are of good size. White birch is very abundant, and probably shares with the Banksian pine the honour of second place in point of numbers. One white birch near the west end of Lake Dufault measured 6.5 feet in circumference, while another on the Baie du Grand Penche measured 5.6 in circumference. In spite of the comparative abundance in places of these large birch trees, the Indians of Mistassini seemed to prefer canvas in the manufacture of their canoes.

Balsam poplar is a comparatively rare tree, as the soil is in general too poor and shallow to support this tree.

Banksian Pine is perhaps next to the black spruce the most abundant, it grows in both wet and dry places, but reaches its best growth in dry, sandy or gravelly flats or hillsides. The variety growing alongside of certain of the streams has often very beautiful branches extending to the ground. The Larch (tamarac) formerly was abundant alongside of certain of the swampy streams, but with few exceptions these were all killed in 1893-94 by the larch sawfly or larch worm (Nematus erich sonii). Some of the new larches now growing are from 25 to 30 feet high.

The undergrowth in the woods is chiefly Labrador Tea (Ledum latifolum) and laurel (Kalmia glauca) which, especially the former, grow, in very thick masses generally from three to five feet in thickness. On the northern side of the height of land and especially on the northern slopes the ground is covered to a considerable depth (generally from two to three feet but sometimes more) with the bog moss "Sphagnum" with here and there small patches of the true "reindeer" moss (Cladonia).

A section of this, which has in many places been exposed, from the top downwards shows:

1. A layer of the living bog moss sphagnum; (2) a layer of pale brownish dead moss with partially decayed branches and trunks of bushes and trees; (3) a layer of much deeper coloured (brown) moss with some decayed fragments of trees, which in turn shows a gradual transition downwards into; (4) a layer of well matured peat, brownish to almost black in the lowest portions of the layer. In the lowest part of this layer the vegetable structure is often quite indistinct and much of the material in the hollows and fissures shows a distinct passage to lignite.

This moss and its lower layers of decomposition form a deep and wondrously soft carpet which on account of its soft yielding nature and thickly disseminated remnants of fallen branches and trees renders travelling exceedingly difficult and tiresome.

At the same time it forms a very effectual and complete mantle, completely concealing the underlying rocks even on some of the steepest slopes and declivities. Prevalence and depth of this moss in most cases presents an almost insuperable barrier to economical prospecting, the thick, tough and tangled mass being removed only with great difficulty and labour. This moss and Labrador tea grow luxuriantly on certain portions of the lakes' shores, especially gravel points, with here and there a black spruce, the whole producing a beautiful open park-like effect which is very pleasing after the thick sombre foliage of the dense black spruce forest.

FOREST FIRES:

In the region covered by our examination there are only occasional areas which have been recently burnt. The largest of these was burnt in the beginning of July of the present year. It extended from the northwestern shores of Dore Lake northeastward to Wakonichi Lake, passing the east end of Bourbeau Lake and burning most of the country between Cumming Mountain and Lac Vert. In all, the trees over an area of about 25 square miles were destroyed. During 1907 when prospecting seems to have been active in this district, many areas were burnt, the largest being to the west and southwest of Assinitchibastat Lake, where at least about 20 square miles were burnt over. There is also considerable burnt area on the Chibougamau River immediately south of the town line between Blaiklock and McKenzie, while still another area was noticed extending along and on both sides of the Barlow River above the Kawasachuan River.

The causes of such fires have often been mentioned, but in most of these cases they appear to have been caused by the negligence of the prospectors. Some of the fires may have been started by amateur prospectors in order to facilitate prospecting, but the areas over which these fires have passed are now almost impassable. It is difficult except after a very long dry spell, which sometimes (as during last spring) occurs, to set fire to the bush, but the fire once started during such a time is soon beyond control, and the depth of the moss and undergrowth requires from a week to ten days almost continual rain to effectually quench it.

SUMMARY OF CONCLUSIONS.

1. From a geological standpoint the Chibougamou Region, in common with other Archæan areas, promises a rich reward to diligent and intelligent prospecting; but the remoteness of the district and the almost universal thick covering of moss and peat renders the search for economic minerals both difficult and unduly expensive. In addition, while large areas probably of equal economic importance from a mining standpoint still remain unprospected in much more accessible portions in Northern Quebec, it would be unwise to devote further attention to detailed prospecting in the Chibougamou District.

2. GOLD. The ore bodies which have gold as their chief value do not contain this metal in a free milling state in sufficient quantity to make stamp-milling feasible. As

smelting ores, the values and apparent tonnage do not offer much encouragement even with railway facilities.

COPPER. While some of the assays of the specimens for this metal run to a good percentage, these are special or picked samples and by no means representative of the various deposits.

Assays which represent a commercial tonnage are rarely above 2 per cent., which is not at present marketable.

NICKEL. Although there is a close analogy in mineralogical composition and origin of the chalcopyrite and pyrrhotite occurring at Copper Point to the famous nickel and copper deposits of Sudbury, the deposits themselves as well as the nickel contents as shown by the assays are too small to render them commercially valuable at least for their nickel values.

ASBESTOS. The asbestos noticed in the working faces of the various open cuts as well as in the dumps is insignificant in amount and altogether insufficient for their successful development as mines.

IRON. While some of the occurrences of magnetite are in large deposits, they are usually very low in iron, less than 20 per cent., with only very minor segregations in places of high grade ore. Such ores will only become commercial possibilities at some uncertain time in the future.

SULPHUR. Iron pyrites occurs thickly disseminated through the green schists and schistose diabases at Paint and Sorcerer Mountains, and also in a vein with specular iron ore at Hematite Point, but no large deposit of sufficient purity to mine for sulphur was found.

PULP. If the greatly increased use and demand for wood pulp continues so as to permit of the use of the smaller black spruce and jack pines, the area immediately surrounding Lake Chibougamou shows a very abundant supply of these trees.

AGRICULTURE. The district is altogether unsuitable for agriculture both by reason of the general sterility of the soil, when present at all, as well as the extreme rigour of the climate.

RAILWAY. Your Commissioners regret that after carefully weighing the evidence which has accumulated as a result of their examination and study of the district, they cannot find that the mineral deposits so far discovered are of sufficient merit to justify the spending of public money in the building of a railway as proposed from Lake St. John to Lake Chibougamou.

A GEOLOGICAL TRIP IN SCOTLAND

Written for the CANADIAN MINING JOURNAL by WILLET G. MILLER, Provincial Geologist of Ontario.

Scotland has been a great mother of geologists. At the end of the eighteenth century Hutton (1726-1797) with his "Theory of the Earth," and his disciple Playfair with the "Illustrations," placed the science on the road which it has since followed. The heroic struggle between the plutonists, as Hutton and his Edinburgh school were called, and the neptunists, or those who sided with the great Freiberg professor, Werner, was a memorable one. Among Scottish geologists who were connected with this controversy may be mentioned James Hall (1761-1832), to whom is due the establishment of experimental research as a branch of geological investigation, and Robert Jameson (1774-1854), who upheld the Wernerian system. Of this period were John Macculloch (1773-1835), an eminent pioneer worker on the pre-Cambrian and author of remarkable maps, and William Nicol (about 1768-1851), to whom the petrographical branch of the science is much indebted. William Maclure (1763-1840), born at Ayr, has been called the "Father of American Geology."

Then onward through the years there always have been eminent leaders of geological thought among Scotchmen, e.g., Murchison (1792-1871), the founder of the Silurian system, and Hugh Miller (1802-1856), whose writings did so much to popularize geology. To this list may be added the name of the Canadian, Logan (1798-1875), of Scottish ancestry and educated in Edinburgh. Among Scottish geologists still living may be mentioned the brothers Geikie, Sir Archibald and James, the former of whom by his text-books and other writings, has had a greater influence on students of the science than has any other author. Then there are Peach, Horne and other investigators, who have added much to our knowledge of the history of the earth. Most Scottish geologists have resided in Edinburgh and have doubtless received much of their inspiration from the surroundings of the city. Edinburgh is probably unsurpassed in the facilities it offers to beginners in the study of geology. "On every side of us are incentives to study. Crag and hill rise around us, each eloquent of ancient revolutions, and each a silent witness of the revolution in progress now. At our very gates tower on one side the picturesque memorials of long silent volcanoes, with their crumbling lavas and ashes. On the other lies the buried vegetation of an ancient land, with the corals and shells of a former ocean." *

A cynic might say that Scotchmen take to geology for the same reason that they do to theology. In both sciences it is difficult at times to prove that the other fellow is absolutely wrong. This gives opportunity for argument. But whatever be the explanation of the mental attitude of the people towards other sciences, the character of the country has doubtless had much to do with the popularity of geology:—

" O Caledonia! stern and wild,
Meet nurse for a poetic child!"

or, let us add, for a geologist.

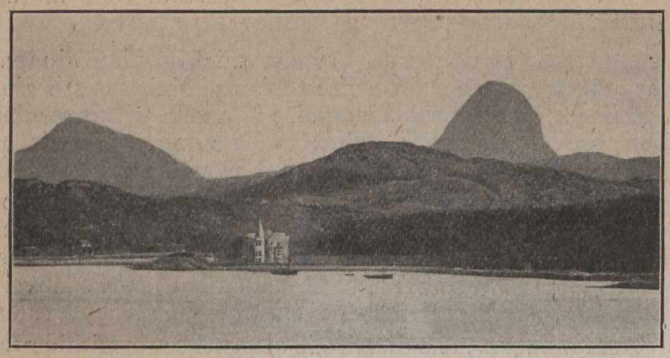
The Pre-Cambrian.

While Scotland offers classic localities to students of most branches of geology, its pre-Cambrian rocks will appeal strongly to the majority of Canadian students of the science. Our country has a greater expanse of these rocks than has any other land—approximately half of it, or 1,900,000 square miles, being underlain by rocks of this age.

North-West Highlands.

Owing to the importance of a close study of the pre-Cambrian rocks in this country, it is of great value

* Sir A. Geikie, "Geological Sketches."



Culag Hotel, Lochinver. Lewisian Gneiss in foreground Mts. Canisp and Suliven in background.

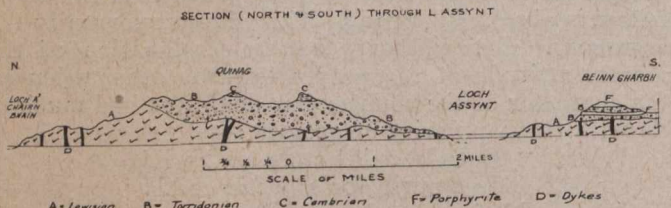
to workers here to have an opportunity of visiting areas of rocks of like age in other countries, especially where they have been studied and mapped in detail. For this reason the wrtier, while on a trip to Europe during the past summer, spent as much time as possible in the Northwestern Highlands of Scotland, a region which has been studied closely by three or four generations of geologists. It has been mapped in greater detail than has any other pre-Cambrian region in the world, and it exhibits some of the most striking illustrations of pre-Cambrian stratigraphy and structure to be found anywhere.

The success of my visit to the Highlands was due chiefly to Dr. John Horne, F.R.S., of the Geological Survey, who, while I was in Edinburgh, kindly drew up a daily programme for me so that I might see typical localities of the pre-Cambrian rocks and of their structural relations in the all too brief time I had to devote to the trip.

Itinerary.

From Edinburg I proceeded to Inverness, thence northwestward to Lairg. Here motor stage was taken to Loch Inver, on the northwest coast, where there are striking exposures of the Lewisian, reminding one forcibly of the typical Laurentian gneiss of Canada.

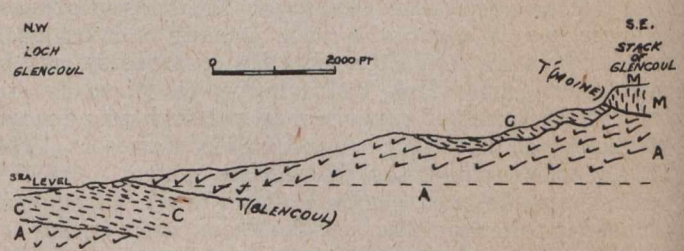
Having examined exposures of the basement rocks at Loch Inver the route was retraced eastward to Inchnadamff and Loch Assynt. Immediately north of Assynt is the mountain Quinag, extreme summit 2,653 feet. At its base is the Lewisian gneiss which is overlain by Torridon (pre-Cambrian) sandstones. The summit is capped by a small outlier of Cambrian quartzite.



(After Geological Survey of Scotland.)

On the west side the mountain is flanked by precipitous cliffs 500 to 700 feet in height. For a long distance the rocks of the three ages can be distinguished from one another by their colour.

From Inchnadamff a trip was made to Kylesku and Loch Glencoul where the famous "thrust planes" are to be seen in striking exposures. The character of the thrusts will be gathered from the following:** "The most important feature in the geology of the Northwest Highlands, which renders this region of surpassing interest to the geologist, is the evidence relating to the terrestrial movements that took place in post-Cambrian time. From a detailed examination of the structures in the field and from certain experimental researches . . . . it can be seen that under the influence of horizontal compression, or earth-creep, the rocks in that area behaved like brittle rigid bodies, and were folded over each other, snapped across, piled up and driven westward in successive slices . . . . . The most easterly and perhaps the most powerful of these disruptions, to which the name of "Moine Thrust" has been given, differs from all those to the west in two important points. First, the materials overlying that plane comprise the Eastern Schists — the fourth of the great rock groups referred to . . . . secondly, in some instances the strata overlying this (thrust) plane have been driven so far west—for ten miles at least in the Durness area—that they rest almost directly on the undisturbed Cambrian rocks. Hence arise those deceptive sections where there seems to be a normal sequence from the fossiliferous Cambrian zones into the Eastern Schists." The "belt of complication" extends for 120 miles from the north coast of Sutherland to the southern promontory of the Isle of Skye. The following map of the area adjacent to Loch Glencoul illustrates the character of the thrust planes. The point separating Loch Glencoul from Loch Glendhu is composed of Lewisian gneiss, the basement rock, overlain by Cambrian strata. Above the Cambrian is a thrust plane, the Glencoul thrust, and overlying this thrust plane the Lewisian gneiss and Cambrian strata are repeated. Above the latter strata is another thrust plane, known as the Moine thrust, and overlying this thrust plane are the Moine, or Eastern, schists. There are minor thrusts in this section to which we need not refer. The following diagram of the Glencoul section is a slightly modified copy of one in the memoir of the Geological Survey.



Leaving Inchnadamff, I proceeded southward to Loch Maree, one of the most beautiful lakes in Scotland, in order to examine especially exposures of crystalline limestones with their associated rocks and their relation to the Lewisian. The limestones with their accompanying schists were found to be much like those of the Grenville series of southeastern Ontario.

From Loch Maree I travelled southward to Glenelg, where crystalline limestone and other rocks were examined in Glen Beg.

From Glenelg a steamer was taken to Mallig, thence by railway to Fort William to see the rocks of Ben Nevis. This finished the programme arranged for me and I returned to Edinburgh via Glasgow.

In Scotland, a Canadian is constantly struck with the difference between doing geological work there and in Canada. In the Highlands, on a clear day, the various rock groups on the treeless hills can be recognized from a long way off, while in forest-covered Ontario,

** See "The Geological Structure of the North-West Highlands of Scotland," Memoir of the Geological Survey of Great Britain, for this and following quotations concerning geology in this paper.

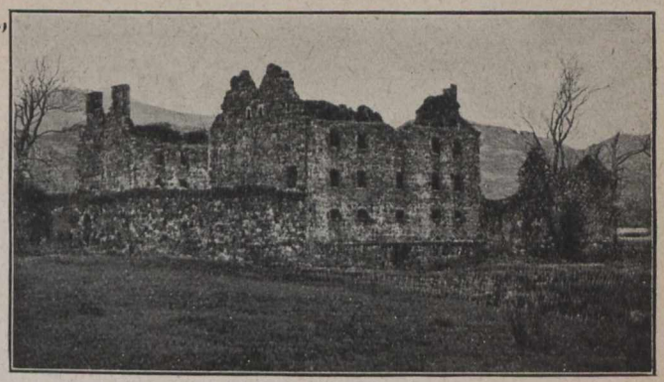
for instance, a geologist often cannot see more than a hundred yards ahead, and has to search for outcrops almost yard by yard. Again, in Scotland, even in desolate areas, one frequently has his attention distracted from the rocks to something of historical or antiquarian interest. For instance, in a lonely glen near Lochinver a circular opening in the cliffs was pointed out as having been used as a pulpit. "It was grand to hear them singing the Gaelic hymns." On the north side of Loch Assynt are two ruins, in one of which Montrose is said to have been betrayed. Loch Alsh, near Glenelg, was the scene of some of Prince Charlie's exploits, and at the latter place is the ruins of a barracks erected about 1715 to keep the wild Highlanders in subjugation. It is fortunate, probably, that previous to the trip I had time to look up only the geological literature, otherwise I might have had my attention still more distracted from the rocks. Moreover, to discover things for oneself added to the charm of the trip in some ways. Thus, on going to see the limestones in Glen Beg, than which "there are not many Highland glens more attractive," I came unexpectedly on the Pictish towers. It was almost like exploring an undescribed region. "The valley is rendered still more interesting by these remains of Pictish towers which it contains, and which, if not perfect, are still sufficiently entire to explain the structure of these

Inchnadamff on a misty morning, showing part of Loch Assynt and Torridon Rocks in the background.

singular buildings. In an antiquarian view they are even more interesting, not only on account of their singularity, antiquity and obscurity, but because they are by much the most perfect, as well as the most accessible, specimens" of the earliest native architectural remains. Whether these Pictish towers, or burghs, are of Danish or purely native origin, has been disputed. These large circular structures are built of unhewn stone and entirely without cement. Many remains of the towers can still be traced in the Highlands. The masonry is remarkably well laid and the lines of the curvature are beautifully preserved, the form being that of a truncated cone.

Outline of the Geology.

In the opening paragraph of the introduction to the great memoir on the "Geological Structure of the Northwest Highlands," Dr. John Horne so briefly and interestingly summarizes the present knowledge of the geology and the history of the work of unravelling the relationships of the rocks, that we may be permitted to quote his words: "In the North-West Highlands of Scotland four great rock-groups are remarkably developed, each characterized by a peculiar type of scenery and illustrating in a vivid manner the intimate relation that exists between geological structure and the evolution of mountain-forms. Each group has impressed its own individuality on the landscape in such a manner as to arrest the attention not merely of the geologists, but even of the casual and unscientific traveller. These four groups are in consecutive order from west to east: 1st, the Lewisian or Fundamental



Barnera Barracks, Glenelg.

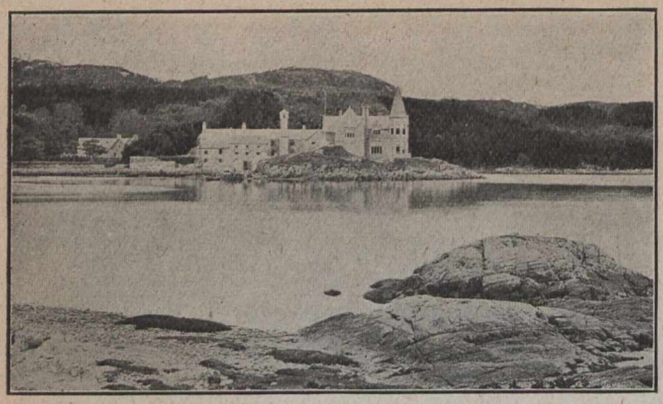
Gneiss; 2nd, the Torridon sandstone; 3rd, the Cambrian formation; and, 4th, the Eastern schists. Ever since the time of Macculloch, at the beginning of the last century, the stratigraphical position and relative age of these rocks have been a subject of animated discussion and, for a time, of keen controversy. Relying on the apparent order of superposition, the earlier observers naturally inferred from the magnificent sections laid bare along the western fjords and on the grand escarpments and dip-slopes of the mountains, that the Eastern Schists follow the Cambrian strata in conformable sequence. But the geological structure which seems at first sight so simple, has proved, on later detailed examination, to be extremely complicated. The apparent succession has been found to be deceptive, and the superposition, which is undeniable, is now ascertained to be due to great terrestrial displacements, which have no parallel elsewhere in Britain."

Owing to the marked contrast in the lithological character between the three great series of rocks—the grey or pink Fundamental gneiss, the red Torridon sandstone, and the white Cambrian quartzites with the limestones and dolomites—it was possible for the officers of the Geological Survey to trace the several portions of these formations even through extremely complicated structures.

Lower Picts Tower, Glenbeg, Glenelg.

Early Work in Scotland and Canada.

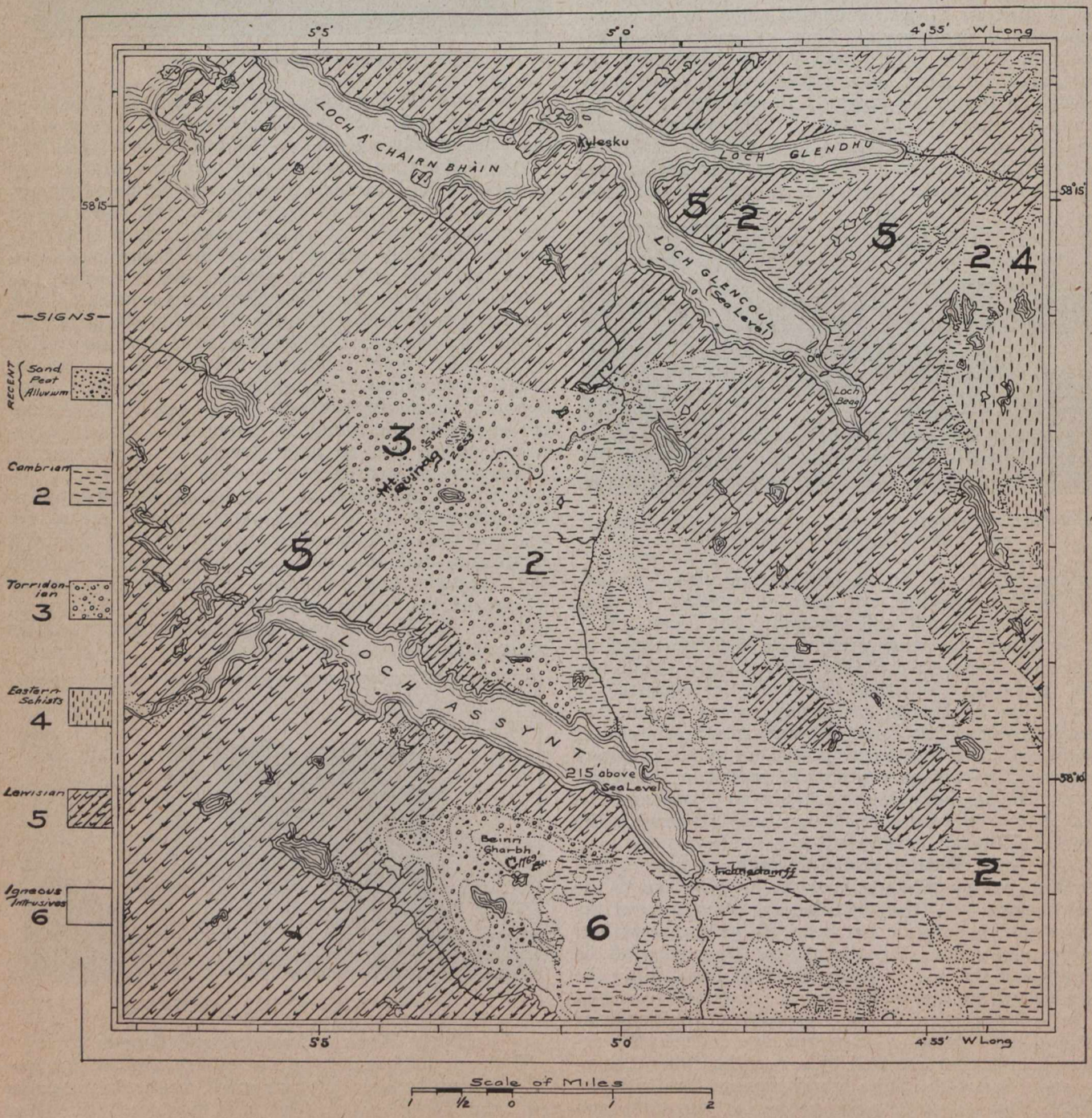
Between 1814 and 1824 Macculloch proved the true relationship between the two great series, the Lewisian and the Torridonian. This relationship is like that which exists between the Huronian and the Laurentian



Culag Hotel, Lochinver, with exposures of Lewisian Gneiss.

of Canada, where work did not begin on the pre-Cambrian till nearly twenty years later. In 1827 Murchison and Sedgwick visited northwest Sutherland. From this time on, during the thirty years or so that Logan and his assistants were working out the structural and age relations of the pre-Cambrian rocks of Canada, the ancient rocks of the Northwest Highlands received much attention, notably from Murchison and J. Nicol. By 1860 the latter had worked out the relationships of the rocks so completely that he is admitted to have "displayed the qualities of a great stratigraphist in grappling with the tectonics of one of the most complicated districts of Europe."

The papers published on the Highland rocks and the controversies concerning them, during the period to which reference has been made, must have been of



Geological Map of the area in the vicinity of Lochs Assynt and Glencoul, Sutherlandshire. The map shows the area distribution of the pre-Cambrian (Lewisian and Torridonian) and the Cambrian together with the two thrust planes at Loch Glencoul. (After colored may of the Geological Survey of Scotland.)

much interest, and doubtless acted as an inspiration, to Logan and his associates engaged with similar problems.

The Lewisian.

The Lewisian or Fundamental Gneiss stretches as an interrupted belt from Cape Wrath to Loch Torridon. Like much of the territory occupied by the Laurentian of Canada, this belt of country is remarkably bare and sterile. Rounded domes and bare ridges, with intervening hollows, follow one another.

The Lewisian system occupies a position in relation to the sandstones and conglomerates of the Torridonian similar to that which the Laurentian and Keewatin do to the fragmental Huronian and Keweenawan series of Canada. In other words the Torridonian rests on the Lewisian with strong unconformability. Moreover, like the typical Laurentian, the Lewisian rocks are characterized by banded and foliated structures.

The Geological Survey of Scotland has arranged the Lewisian in two groups: (1) a Fundamental Complex, composed mainly of gneisses that have affinities with plutonic rocks, and, to a small extent, of crystalline schists and limestones which are probably of sedimentary origin; (2) a great series of igneous rocks intrusive in the Fundamental Complex in the form of dikes and sills.

Group (1) is very similar to that which was embraced under the name Laurentian by Logan, whose classification has been used up to comparatively recent times in Canada. The gneisses of Scotland correspond to the typical banded gneiss of Logan's Laurentian, while the crystalline limestones can be compared with his Grenville series, which was placed by him in the Laurentian system. During recent years in Canada the name Laurentian has been used in a more restricted sense.

Sediments in Lewisian.

In the memoir to which reference has been made, Dr. Horne says: "If the stratigraphical relation of the altered sediments of the Lewisian gneiss to the gneisses that have affinities with plutonic rocks could be definitely ascertained, it would possess much geological interest, in view of the antiquity of these sediments and the relative ages of the original types of gneiss. There is no clear evidence that these types are intrusive in the former, but, in certain places, the two are so intimately associated as to suggest that the rocks of igneous origin may have been injected into those of sedimentary origin. On the other hand, there is undoubted proof that, north of Loch Maree, the altered sediments rest on a platform of gneiss and are locally overlain by gneiss with basic dykes, the superposition of the gneiss on the sediments being there due to folding and thrusting."

The sediments, consisting of the crystalline limestones and associated rocks, are much like the sediments in the Keewatin-Laurentian complex of southeastern Ontario. Mr. Cyril W. Knight and the writer have expressed the opinion that the older crystalline limestones here represent marine precipitates which have been deposited on the surface of the Keewatin lava flows. Then the rocks having been subjected to stresses, in many localities, a complexity has been produced which is difficult to unravel. In so far as the writer could see, a similar relationship may exist between the crystalline limestones and some of the other Lewisian rocks of Scotland.

The igneous gneisses of the Fundamental Complex of Scotland represent plutonic types, while the Keewatin rocks of Canada, our oldest rocks, are volcanic. This difference may be accounted for by the fact that the period of denudation prior to the deposition of the Torridonian sediments was more prolonged than was the period of denudation in Canada prior to the deposition of the Huronian sediments, which do not seem to be represented in the Northwest Highlands. In this Scottish region the surface igneous rocks have been eroded and the underlying plutonic types have been exposed, while in Canada denudation did not go far enough to remove the surface material, now represented by the Keewatin. "It is remarkable that their (Torridon sandstones), enclosed pebbles include pieces of quartzite, which show contact alteration, spherulitic jaspers that have been formed by the silicification of liparites, and spherulitic felsites which closely resemble those of Uriconian age in Shropshire. As these fragments have all been derived from formations that are now not visible anywhere in the western part of the Counties of Sutherland and Ross, they furnish further evidence of the denudation of the Archean plateau in the pre-Torridonian time."

In other words, the quartzite pebbles show that pre-Torridonian fragmental series, probably to be correlated with the Huronian of Canada, and the liparites and felsites show that a series of volcanic rocks have been removed by denudation, bringing to the pre-Torridonian surface the plutonic types of the Fundamental gneiss. The felsites and other volcanic types may represent a series comparable in age with the Canadian Keewatin.

(to be continued.)

THE POSSIBILITIES OF CANADIAN PEAT

An Address delivered by DR. EUGENE HAANEL, Director Mines Branch, Ottawa, Ont., before the Toronto Canadian Club.

On a former occasion I had the honour of addressing the members of this Club on the subject of electric smelting. I am happy to be able to state that the production of pig iron by the electric process has been solved both technically and commercially. When the projects now under way in Sweden are realized it will mean the annual production of 250,000 tons of electrically produced pig iron—nearly one-half of the whole output of Sweden at the present day.

I regard it as a special privilege to be permitted again to address you on a subject of importance to the business interests and the domestic happiness of the inhabitants of Canada.

In a country such as ours, where, in addition to the increasing amount of fuel required for industrial purposes, we are, during the long winters, dependent upon artificial heat in our homes, the item of cheap fuel and its economic use becomes one of the most important factors in the comfort and prosperity of the nation. I have, therefore, chosen as the subject of my address: "The fuel supply of the central provinces and its economic use."

I confine my remarks to the central provinces, because these provinces are almost wholly dependent upon outside sources for their fuel. The other provinces are sufficiently near the immense coal deposits of the ex-

treme east and west to render them available as sources of fuel, without increasing the price unduly by the cost of long haulage.

The fuel resources of the central provinces are represented by:

1. The wood still standing.
2. Our oil deposits.
3. The oil contained in the oil shales of New Brunswick.
4. The lignite of Manitoba.
5. Water powers—the houille blanche—or white coal of the French.
6. And lastly, the peat deposits of these provinces.

With the exception of the lignite of Manitoba and the peat deposits and, to a continually decreasing extent, the wood of our forests, the other classes of fuel named play an insignificant part as sources of fuel for domestic use and, with the exception of the utilization of our waterfalls for the production of power, imported coal is the staple fuel for these provinces.

For the year 1909 we imported coal to the amount of nearly 10,000,000 tons, valued at $26,831,859.

The current prices of coal and wood, as per "Labour Gazette," September, 1910, are:

a

	Coal.	
	Anthracite. per ton.	Bituminous. per ton.
Toronto	$ 6.75	$5.00
Montreal	6.00	5.00
Ottawa	7.50	5.50
Winnipeg	10.50	9.00
Vancouver	....	7.50
	Wood.	
	Hard. per cord.	Soft. per cord.
Toronto	$7.50—$8.00	$5.00
Montreal	8.00	6.00
Ottawa	6.50	3.50
Winnipeg	6.00	5.00
Vancouver	4.00	....

The increase in the cost of living and the price of our manufactures, consequent upon the high prices for this absolutely necessary material, might be counterbalanced by increased energy, activity, and business ability as long as we are assured of a constant supply. Conditions, however, as they exist to-day may not continue, but change, and change suddenly, and we may find ourselves deprived of fuel from the United States, without warning. For such an event we have made no provision, we have accumulated no extra store to meet such an emergency, but import only what is needed annually. A few years ago the strike in the coal mines of the United States demonstrated that such an event must be reckoned among the possibilities. I need not point out that other causes than strikes might deprive us for long periods of this outside source of fuel. It is, therefore, wise and statesmanlike to make provision for any emergency and seek within our own territory the means of supplying this all-important necessity.

Fortunately, nature has provided a substitute for coal and wood in the peat bogs scattered in abundance throughout the central provinces. It has been estimated that the known peat bogs of Manitoba, Ontario, Quebec, and New Brunswick cover in the more settled portions of these provinces an area of 12,000 square miles, with an average depth of 6 feet. This is probably but a small fraction of the actual amount of this valuable fuel asset in existence in these provinces.

One square mile of peat bog with an average depth of 6 feet will produce 774,400 tons of peat fuel, containing 25 per cent. of moisture. The 12,000 square miles will, therefore, contain 9,292,800,000 tons of peat, having a fuel value equivalent to 5,306,074,000 tons of good coal. Such an amount of peat would supply fuel to 5,306,076 families for 100 years, assuming each family to consume an amount of fuel per annum equivalent in heating value to 10 tons of the best anthracite.

To ascertain more accurately our peat resources, the Mines Branch began, three years ago, an investigation of the more important peat deposits favourably situated as regards transportation.

Since the quality of the peat contained differs greatly for different bogs, some being suitable for the manufacture of moss litter, while others contain peat sufficiently humified for the manufacture of peat fuel, instructions were given to ascertain not only the extent and depth of the peat bogs, but also the quantity and quality of the peat contained. So far, some 14 bogs have been investigated and mapped, and it is hoped that the information contained in our reports will prevent the exploitation of bogs for purposes for which the peat contained is unsuitable.

Many attempts have been made in Canada to utilize these peat resources for the manufacture of fuel, but up to within recent times unfortunately with little success, and with the waste of large capital. The reason for these failures is largely due to lack of knowledge of the nature of peat and the processes employed for the commercial manufacture of peat in the peat-using countries of Europe.

To furnish this necessary information to prospective manufacturers of peat fuel, the Department sent a member of the staff of the Mines Branch to Europe to investigate and report upon the manufacture of peat for fuel and other purposes in the peat producing countries of Europe. A few months after the appearance of this report, the Iron and Steel Institute of Sweden offered its writer the position of peat expert of the Institute, which he accepted.

Further to encourage the peat industry of Canada, it was deemed essential to furnish actual demonstration of a successful commercial process of the manufacture of fuel from peat as practised in Europe, by the erection and operation of a plant in Canada. To carry out this idea the Department purchased 300 acres of peat bog with an average depth of 8 feet, near Alfred, Ontario, and erected a peat fuel plant, such as is used in Sweden and Russia for the manufacture of air-dried machine peat. There are 1,300 such plants in operation in Russia, which in 1902 produced 4,000,000 tons of peat fuel, with a yearly increase since then of nearly 200,000 tons. Many private plants exist in Russia in connection with cotton mills, producing annually 200,000 tons of peat fuel.

The process is an exceedingly simple one. The peat is dug by hand and transferred by an elevator into a pulping mill. The pulp resulting is conveyed by cable cars to the drying field, rolled out into a sheet of some 4 inches in thickness by a field press, which also divides the sheet into longitudinal strips, which are further divided transversely by means of 3-bladed roller knives, operated by a labourer. The pulp is thus divided into blocks, which are left to dry on the field. Turning and stacking for more complete drying is done by boys. The pulp mill, cable cars and field press are operated by a steam engine. The capacity of the plant is from 25 to 30 tons per 10-hour day. During last season, operating

for 50 days, 1,500 tons of peat fuel were manufactured. The weather conditions of the season were very unfavourable, the men employed new to their work, and changes required in a new plant involved a number of stoppages. Under this severe test, the amount of fuel produced must be regarded as thoroughly satisfactory. The plant was visited by the members of the American Peat Society during their recent meeting in Ottawa in July last. Many other parties interested in peat have taken the opportunity to examine the plant and witness its operation.

In my address before the American Peat Society, which met at Ottawa last summer, I stated that, allowing 140 days for a season's operation, the cost per ton of fuel, including interest on capital invested, amortization, oil, and repairs, is as follows:

Cost of fuel on the field ..... $1.40 per ton.
Cost of fuel stored in shed ..... 1.65 per ton.

I have since then, however, come to the conclusion, that probably 110 working days will, considering our climatical conditions, be a fairer estimate of the period during which peat can be manufactured. This shorter period of production will increase the cost of manufacture to about $1.50 per ton on the field with our plant.

Some 600 tons of this peat fuel were sold in Ottawa and the vicinity of Alfred, and it has given great satisfaction. Constant application is made to the Department for additional supplies and telegrams received from outlying towns asking for carloads of it. These demands could, unfortunately, not be met, as the remaining amount of peat fuel is required for our fuel testing plant at Ottawa.

The fuel manufactured is specially adapted for grates, cooking stoves, and wood stoves. In fact, for the grate this fuel is far superior to cannel coal. Its advantages over cannel coal are:

1. It burns with a clear, luminous flame, without poking.
2. It does not eject into the room burning particles, does not, therefore, require a wire netting to protect the floor.
3. It leaves no unburnt material. The ash left is a soft flocculent powder.
4. It does not soil the hands.
5. It does not, as cannel coal, cover the back of the grate with a thick layer of soot.

Its disadvantage is its greater bulk.

The Government peat plant at Alfred serves the purpose of demonstrating the manufacture of air-dried machine peat and is suitable to be operated on bogs near villages or by groups of farmers who own peat lands and who are desirous of making their own fuel, as a cheap and excellent substitute for the high priced coal which they are now obliged to purchase. This is successfully done in Europe. The cost of the plant amounts to $7,600.00, including duty and freight on engine, peat machine, cars, and rails.

For the manufacture of peat fuel on a large scale, say 20,000 to 30,000 tons annually, mechanical excavators, spreaders, and cutters should replace the manual labour employed at our plant. On account of roots and stumps which are found in most bogs, the mechanical excavators brought on the market have not hitherto proven successful. It is only within the last two years that the problem of the construction of a successful excavator has been solved by Lieutenant Ekelund, of Sweden. By the employment of his machinery the cost per ton on an annual output of 30,000 tons is reduced to 92 cents in the shed.* This figure includes interest and amortization of the bog and machinery, transportation to shed, interest and amortization of the sheds, management, taxes, etc. Both Mr. Hystrom, the peat expert of the Iron and Steel Institute of Sweden, and Mr. Wallgren, the peat expert of the Swedish Government, who each investigated the Ekelund plant for three weeks, have verified this astonishingly low figure of the cost of production of the peat fuel as 92 cents per ton. By the adoption of the Ekelund machinery the problem of economically producing air-dried machine peat may be regarded as solved and the successful inauguration of a peat fuel industry looked forward to with confidence.

Ekelund, however, starting from air-dried machine peat, with 40 to 50 per cent. of moisture, carries his process further to obtain a product in the form of powder with 10 per cent. of moisture, the heating effect of which is stated to be equivalent, pound for pound, to the best English bituminous coal. This peat powder is admirably adapted for industrial purposes. Blown under a boiler, it burns with a long hot, smokeless flame, leaving no unburnt particles. The flame is readily regulated, extinguished and relighted at pleasure. The firing is automatic. The powder is a magnificent fuel for steam raising. As it gasifies instantly and completely, it deposits no soot on the tubes or other surfaces and avoids the smoke nuisance consequent upon firing with soft coal. There are no clinkers; the ash is a soft, friable powder, which is conveniently removed by a suction fan. Professor Odelstierna reports that the powder is not liable to spontaneous combustion, is admirably adapted to metallurgical operations, the flame being easily changed from an oxidizing to a reducing flame and vice versa. The combustion of the powder produces the highest temperature which the structural material of our furnaces can stand. Furnaces using peat powder are more cheaply constructed than furnaces using soft coal or generator gas.

This fuel is specially adapted to the cement, glass, and clay industries.

The Ekelund process has, moreover, the advantage of being independent of weather conditions, since the partially air-dried peat harvested during the summer months may be worked up into peat powder during the winter months.

The cost of manufacture of one ton of peat powder made from air-dried peat, including power, wages, interest, amortization, management, taxes, insurance, wear of bags, etc., is in Sweden $2.30 per ton.

Cost of plant, including the necessary machinery, furnaces, buildings, all complete for the manufacture of 20,000 tons annually, is $86,000.

The interesting statement has come to hand, that as a result of instructions received by the Railroad Commission of Sweden from the King, to investigate the feasibility of using peat fuel in locomotives, the Commission recently recommended the construction of freight engines using peat fuel. Designs for two engines have been submitted by the Commission; one larger, requiring two firemen, to have the same traction power as the regular type E of the Government railways, the other smaller, requiring but one fireman.

Whatever fuel, however, we use, be it imported coal or peat fuel, it is in the interests both of economy and the conservation of our fuel resources, that for manufacturing purposes we employ methods which will convert the largest number of heat units stored in the fuel

*The cost of common labour in Sweden is from $1.08 to $1.22 per day of 10 hours.

into useful work, or, to state this in another way, convert the heat energy of the fuel into useful work with the least possible loss.

The general practice pursued in our manufactories of converting the energy stored up in the fuel used into useful work, by burning it under a boiler and utilizing the expansive power of the resulting steam in a steam engine, is a wasteful and inefficient method.

Using a coal of 12,500 B.T.U. per pound, at $4 per ton, an ordinary 250 h.p. steam plant requires a minimum of 5 pounds per B.H.P.H. This amounts to 15 tons, costing $60 per h.p. year of 6,000 hours.

Contrast this with a h.p. year developed in a modern gas producer power plant, which consumes only 1½ pounds of coal per B.H.P.H., that is, 4½ tons for a h.p. year of 6,000 hours, costing $18. For peat containing 25 per cent. of moisture and 6,750 B.T.U. per pound, burnt in a producer, 2½ pounds are required for a B.H.P.H., assuming the power station to be erected on the bog and cost of manufacturing peat $1 by the Ekelund process, (Ekelund's figure is 92 cents), the figures are as follows: for a h.p. year of 6,000 hours, 7½ tons are required, costing $7.50.

Compare these figures:

Cost of coal for steam plant for one h.p. year of 6,000 hours	$60.00
Cost of coal for gas producer power plants	18.00
Cost of peat, 25 per cent. moisture, for peat gas-producer power plant	7.50

These figures relate to plants of small capacity.

For larger plants, both steam and producer gas plants, the relative consumption of fuel will be proportionately less.

The great economy effected by a gas power plant over that of a steam plant will be manifest when it is stated that the most perfect and skilfully operated steam plant probably in existence to-day, namely, the power plant of the Interborough Rapid Transit Company of New York City, requires 2 pounds of coal per B.H.P.H., while an ordinary producer plant requires only 1¼ pounds. The saving effected by a producer plant in cost of fuel, over that of the most perfect steam plant, calculating coal at $4 per ton, is $6 per h.p. year of 6,000 hours.

Suppose that 5,000,000 tons of the coal imported into Canada are employed for the production of power by ordinary steam plants, it is evident from our figures that for the production of the same power in a gas producer power plant only 1,500,000 tons need to be imported. This not alone cuts down our coal bill for power to less than one-third of what we are now spending and sending in cash out of the country, but we are saving also to some extent labour charges in handling at the plants two-thirds of the coal now used in steam power plants.

The economical results to be achieved by the introduction of peat gas power plants are so promising that the Mines Branch installed last year at our fuel testing station at Ottawa, for purposes of investigation and demonstration, a Korting peat gas-power plant, consisting of a producer, gas engine, and dynamo, each of 60 h.p. capacity. Several tests have already been made, and the plant is now regularly used for running the machinery of our concentrating laboratory, requiring about 40 h.p. The amount of peat fuel consumption is about 2½ pounds of peat with 30 per cent. of moisture for one B.H.P.H.

At present we are installing a 100 h.p. producer for lignite and soft coal, which we confidently expect can be operated successfully with peat. When this peat gas producer investigation is complete and we are assured that the operation of these producers is uniform and will present no difficulty in practice, we will be prepared to recommend their installation at suitable peat bogs for the production of power, either for industrial purposes at the bog, or for conversion of the power into electricity to be transmitted to neighbouring towns and villages for power and lighting purposes, exactly as in the case of water power.

If this is to be achieved, the present method of working peat bogs for only 10-hour days of the short season of 110 working days must be abandoned in favour of 20-hour days. With peat gas power plants erected on suitable bogs, suitable as regards extent and depth of the bog and quality of the peat contained, the electricity generated at the power station may then be employed for operating the machinery and the transport of the manufactured peat to sheds, while electric lights will illuminate the field for the night shifts.

When this plan, which has been realized in Sweden, has also been put into practical operation in Canada, we will then have rendered ourselves independent to a large extent of outside sources for our fuel; we will have gained another cheap source of electrical energy, where water-power is not available but peat is in abundance, and we will then be prepared, at least to some extent, for any emergency that may threaten a fuel famine.

Proposed Reduction Plant of the Dome Mines Syndicate, Porcupine, Ontario.

(Written for the CANADIAN MINING JOURNAL by a Special Contributor.)

So much has been written concerning the formation and ore deposits of the Porcupine district that a few points regarding the milling properties of the ore, so far as we know them, may be of interest. A discussion of the probable metallurgy in detail would be somewhat premature, so an attempt will be made to bring out only some of the more important results of experiment and give a general outline of the plant which is being installed on the Dome.

During the spring of 1910, a small mill was erected consisting of 1,500-pound Nissen stamp, a 4 ft. by 8 ft. amalgamating plate, and a Deister concentrating table. Weighed quantities of average ore were milled and the work supplemented by laboratory tests to determine a process suitable to the ore.

The ore, which is essentially quartz and greenstone schist, carrying free gold and iron pyrite, was at first considered to be an ideal concentrating ore. The gold was closely associated with the iron pyrite and a high-grade concentrate could be obtained. The tailings, however, were sufficiently valuable to warrant cyaniding. By regrinding the concentrate, it was found that a large percentage of the gold could be recovered by amalgamation. The idea of concentration was then abandoned and experimental work was confined to sliming the whole product by two stage crushing, amalgamating after each and cyaniding the tailings. By grinding to 90 per cent. through a 200-mesh screen, 84 per cent. of the gold was recovered by amalgamation. The ore was particularly free from cyanicides, the only difficulty arising from the presence of a small amount of carbonaceous material which caused a secondary pre-

cipitation. This was overcome by lengthening the period of agitation.

By the middle of August, 1910, sufficient ore had been developed to justify the building of a mill. The stamp mill and cyanide practice of the Western United States was investigated and typical mills were visited. A shipment of ore was made to the Merrill Metallurgical Company, of San Francisco, Cal., as the Merrill system had been decided upon for the secondary treatment. Mill runs were made at their experimental plant and the milling properties of the ore thoroughly tested. The results were so encouraging and the ore so amenable to the treatment that it was decided to take advantage of the winter roads and ship the plant in during the present winter. The Merrill Metallurgical Company was retained to design it.

The mill, which is to be electrically driven, will be built in units of ten stamps each, four units being installed at once. A gravity plant will be obtained by making four drops from crusher to tailings discharge.

Preliminary crushing will be done in two stages, using No. 7½ and No. 5 Kennedy gyratory crushers. Belt conveyors will carry the ore to the stamp feed bins. Chalmers & Williams 1,250-pound gravity stamps will be used with straight back rapid discharge type mortars, screen 18-mesh or coarser. The foundations will be reinforced concrete. Outside amalgamation will be adopted. Superimposed Dorr drag classifiers will be installed over tube mills of the El Oro type, which will be followed by a second set of amalgamating plates. Hydraulic cone classifiers will discharge back to tube mills and overflow to Dorr thickeners. Agitation will be accomplished in a series of continuous Pachucas. Combined thickeners and press tanks will feed to Merrill slime presses which will discharge through automatic tailing samplers.

The gold will be precipitated by the Merrill zinc-dust process. The zinc-dust will be fed to a short conveyor belt, operated by means of floats and counter-weights, at a rate proportional to the volume of solution pumped from the tank. The zinc-dust will be discharged into a mixing cone and the emulsion agitated by a jet of air. A small stream of barren solution will provide a constant overflow which will carry the emulsion down a pipe to the suction of the pump. The solution will be pumped to triangular precipitating presses, precipitation taking place entirely during the passage of the solution through the pump, pump-column, and presses. The precipitates will be acid treated, fluxed, and smelted. A fully equipped assay office, machine shop, and storehouse will be built near the mill.

Nothing has been spared in the investigation and design, and nothing will be spared in the construction and equipment to make the plant a model in every respect.

Some Notes on the Appraisement of Gold Prospects.

(Written for the CANADIAN MINING JOURNAL by R. B. LAMB.)

It is probable that the engineer is called upon for no work requiring more mature judgment and skill than the task of passing upon an undeveloped or partly developed gold prospect. Properly to perform this he must utilize an experience covering varied conditions in many camps; he must bring a ripe technical training to bear; he requires to measure his problem as a manager; and, lastly, he must have the commercial sense developed to a high degree.

It is essential first to investigate the general geological conditions of the mineralized area, and the geology of the particular property. This should be as thoroughly investigated as snow and other obscuring elements will permit. It is not essential, nor is it possible, to make every observation required; but it is necessary to obtain as large an amount of data as circumstances permit. The more thoroughly this work is carried on, and the more completely the facts can be ascertained, the less the liability for error and misconception. A surface showing will necessarily have some stripping or some exposures made; or even a small amount of development work may have been performed. But however much or little this may be, some conclusion on the following points should be sought.

Nature of Vein.—Gangue matter, minerals of the deposit—prevailing country rock—dikes cutting the country, if any—do these dikes influence veins of the camp? Is the ore in continuous veins, lenses, flat sheets, or crushed zones of country, or disseminated through the rock? Are the deposits on contacts, or do they cut formations? What are the probable strike and dip and pitch of the ore shoot? What the physical and chemical characteristics of vein matter and wall rock? Are faults noticeable? Careful observations should be made for minerals that may interfere with treatment, or make chemical treatment difficult and costly. On a gold prospect the ore shoot is usually indefinitely indicated on the surface, but even so, it is imperative to determine accurately the average value of the outcrop or the exposure made, whether it be merely a part of the ore shoot or only a pit on the vein, or a part of the vein not even on or in the ore shoot at all.

In sampling and assaying for this purpose it must be borne in mind that sampling and assaying are methods employed to obtain an average of the ore faces exposed. The work, if done properly, is truly representative of the average value of the exposure. Frequency and system make for correct sampling. It is as glaring an error to shun visible gold as to seek barren spots. You are after an average. An engineer should not tremble at a speck of free gold, nor should barren spots depress him. Time is the essence of intelligent prospect appraisement. No value in terms of money can be placed on an unimproved gold prospect. It is, therefore, in many cases essential to have some certain privileges to permit of carefully determining the speculative risk involved.

Time may be demanded for diamond drilling, test pit work, stripping outcrops, or even for a small measure of development on the ore-body. Such work should only be directed towards determining invisible factors of a technical nature, and not with a view to placing the prospect in condition for valuation. Hence the work is to be carried on at the very minimum of expense, and very rapidly. In all gold appraisements no excuse can possibly be offered for the engineer's neglect to pan very frequently and to sample in many manners. Amalgamation assays are usually advisable, and check fire assays (not neglecting visible gold showings) are imperative for thorough work. The most careful sampling only gives an average value of the exposure. Other factors enter into the probable commercial importance of the deposit. A poor average will not necessarily damn the prospect, and a good average will not necessarily commend it. It is always to be remembered that

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*Mining Engineer, Traders Bank Building, Toronto. Ont.

large low grade deposits may take considerable development, some times even years, to determine their commercial possibilities. Remembering always that the speculative risk of an unimproved prospect is greatest, so also are its potentialities largest. It is, therefore, the whole aim of prospect appraisement to arrive at judgments that tend to reduce the speculative risk to the lowest point, and to raise to the highest probability the value of the accident of location.

The one thing that governs this more than all others, after correct observations on the factors above indicated have been reached, is the experience of the past in other localities. Nothing can outweigh ripe experience in many camps, and the utilization of this knowledge in similar or approximately similar conditions elsewhere.

The history of the development of adjoining properties is a source of valuable information for the guidance of the observer. This is so self-evident that nothing further need be said regarding it.

After the appraiser has reached a conclusion on the expectations of the metal possibilities of the ore deposit itself, he must then bring a full knowledge of mining, milling, and metallurgical processes to bear on his problem. He must figure the ore extraction, reduction of ore, and the probable total cost of his speculation. Managerial risk must not be omitted. His commercial sense must be called into requisition for problems such as transportation, loss of time through weather, labour, and other ever-varying conditions. And all these observations and calculations must be balanced against the probable production of the prospect. The appraiser is then in a position to advise upon these points. How much money, if any, should be paid for determining whether a mine can be proved? How much money, if any, should be spent in development to prove or disprove the observable conditions? Over what time should the expenditure extend? How should this money be spent? In answering the above questions with intelligence the appraisement has been made—and well made.

No money valuation can be placed on undeveloped prospects. It is, therefore, impossible for an engineer to pass on the purchase price as an engineer. If the price of a mine is asked for a prospect, time and terms must be adjusted to develop reasonably a mine with prospective ore reserves. In this case the real work of appraisement is not complete until such a stage of development has been reached as will justify the payment of the purchase price. Development on an approved prospect necessitates frequent observations during the progress of the work. These observations will tend to annul, modify, or amplify the original inspection. In all cases the speculative chance diminishes with development, rejection or acceptance being the inexorable verdict.

Finally the appraiser should be cognizant of the fact that the goodwill, so to speak, of a mine is greatest when it is not a mine—merely a prospect. Hence the allurement.

The C. M. I. National Anthem.

[EDITOR'S NOTE.—We have decided to publish the only authorized edition of the Institute Anthem. As this has suffered much harmful change, and, in the versions current, contains grievous superfluities, we rejoice to be able to print it in its pristine purity. No less an authority than Col. A. M. Hay vouches for every word of the following verses. In fact, Col. Hay has been responsible for the much-needed textual emendations. A single glance reveals the beauty of form and colour, the directness of appeal, the restrained vigour, and, withal, the Homeric simplicity of these restored lines. For thus recovering a gem that was in a fair way to oblivion, principally through dilution, the Institute owes Colonel Hay a colossal debt of gratitude.]

DRILL, YE TARRIERS, DRILL.

Sure every morn at seven o'clock,
There are twenty tarriers on the rock;
All hard at work on the right of way
On Section B of the big railway.
Then drill, ye tarriers, drill.

CHORUS—

Drill, ye tarriers, drill,
For we work all day, without sugar in our tay
While we work beyant on the big railway
Then drill, ye tarriers, drill,
And shtrike and shtrike and turn the drill,
And drill, ye tarriers, drill.

Monologue, finishing with "Are you all ready, then
Blast. Fire. Noise.

English, Irish, Welsh, and Scotch,
French and Germans, Swedes and Dutch,
Poles, Italians, Greeks, begob;
Every country's on the job.
Then drill, ye tarriers, drill.

CHORUS—Drill, ye tarriers, drill.

Monologue, etc.

We go to work in gangs of three
Red-haired Mike and Bill and me;
There's no mistake, we're husky lads
That swing the sleds and hold the gads.
Then drill, ye tarriers, drill.

CHORUS—Drill, ye tarriers, drill.

Monologue, etc.

When the boss come along, says Bill to Mike:
Put all your power on the drill when you shtrike;
Mike winks at me, I wink at Bill,
While we gently shtrike and turn the drill.
Then drill, ye tarriers, drill.

CHORUS—Drill, ye tarriers, drill.

Monologue, etc.

But when the foreman comes in sight
We shtrike and shtrike with all our might.
You can't fool him, because he knows
The kind of shwing and shtrike that goes.
Then drill, ye tarriers, drill.

CHORUS—Drill, ye tarriers, drill.

Monologue, etc.

The cook is a fine man all around,
And his wife is a great big fat fardown.
She bakes good bread, and she bakes it well;
She bakes it harder than the hobs of Hell.
Then drill, ye tarriers, drill.

CHORUS—Drill, ye tarriers, drill.

Monologue, etc.

The foreman's name is Dan McCann,
And I tell you what, he's a damned mean man.
One day a premature blast went off,
And a mile in the air went big Jim Gough.
Then drill, ye tarriers, drill.

CHORUS—Drill, ye tarriers, drill.
Monologue, etc.

Next month when payday came around,
A dollar short in his pay he found.
What for, says Jim; came Dan's reply,
You were docked for the time you were up in the sky.
Then drill, ye tarriers, drill.

Monologue, finishing with "Are you all ready? Then
Blast. Fire. Noise.
Repeat Chorus: Drill, ye tarriers, drill, etc.

ALL OVER.

PERSONAL AND GENERAL.

Mr. Henry Timmins is in New York.

Sir Henry Pellatt recently visited Sydney, where he was accorded a warm public welcome.

Mr. George E. Drummond has returned from Europe.

Mr. John Hays Hammond has returned from Russia.

SPECIAL CORRESPONDENCE

NOVA SCOTIA.

Dominion Coal Output.—The outpit of the mines for January was 293,000 tons. The individual production of the collieries was as follows:

	Tons.
No. 1	51,060
No. 2	52,190
No. 3	14,630
No. 4	32,420
No. 5	27,080
No. 6	18,960
No. 7	16,870
No. 8	12,730
No. 9	26,270
No. 10	14,730
No. 12	19,200
No. 14	5,930
No. 15	930
	293,000

This production for the month of January has only once been exceeded, 314,000 tons having been obtained in January, 1908. The Dominion Steel Company is accumulating a large storage bank of coal at its works in Sydney, and this is rendering it possible to give the mines fairly steady work throughout the slack time of the winter, and will relieve the mines to a corresponding extent in the summer, when shipping is active. This mutual accommodation is one of the good results arising out of the common control of the two companies.

The Dominion Coal Company has in preparation plans for the building of a new coal-loading pier near the present International Piers at Sydney. Accommodation will be provided for very large freighters. The smaller of the present piers was built a long time ago and has grown inadequate for the increased shipments, and the modern type of coal freighting steamer. Work will be commenced on the new pier in the spring.

A contract has also been given to the Simon-Carves Company, of Manchester, England, for the erection of a Baum coal washer. The machinery will be delivered about July next, and it is hoped to have the washer in operation by the end of the year. The washer will have a capacity of 120 tons per hour, and the makers have given very satisfactory guarantees of performance. None of the Cape Breton coals are organically dirty, and any impurities which may be present in the unwashed product are principally foreign admixture, and are very easily removed by the process of washing. Dominion slack after treatment in this washer should be a very nice product and command a good sale.

Mine Managers' Certificates.—It is announced that changes are to be made in the method of examinations for colliery managers' certificates of competency in Britain. A Central Examination Board is to be appointed for the whole kingdom, in place of the District Examining Boards which have had the granting of certificates hitherto. Commenting on the change the "Iron and Coal Trades Review" remarks editorially as follows:

"The existing system of examination is open to criticism upon a number of points. The Boards have conducted their examinations on more or less independent lines, and consequently there has been a lack of uniformity both in the standard of examination, and in the practical qualifications of the candidate . . . . and it is well known that candidates who have failed at one centre can, and do, pass at another."

In another paragraph of the same editorial it is intimated that "when the Coal Mines Regulation Act comes to be revised again, power will be given the secretary of state to grant certificates without examination to persons possessing such foreign or Colonial certificates as may be approved by him from time to time. The report fully recognized the importance of accepting only such certificates as are equivalent to certificates granted in the United Kingdom, both as regards the length and character of the experience, and the standard of the examination, so that there is no reason to anticipate other than satisfactory results from the changes which are now impending."

The matter of mine managers' certificates is one which greatly concerns the growing mining industry of Canada. One of the most vulnerable points is the arrangement which requires the Nova Scotian manager who moves to Alberta, British Columbia, or some other portion of the Dominion to sit again for a certificate in every province of Canada to which circumstances may call him. Surely the coal miners of the West are not so jealous of their brethren in the East as to desire to place barriers in the way, neither are the differences between coal mining in the East and coal mining in the West such as to necessitate two, or maybe three, distinct examinations. It is time that this useless hindrance were removed, and similar steps taken by the mining profession as have already been taken by other professions, such enced and competent men.

A matter which possibly the Canadian Mining Institute could consider profitably would be the institution of a Federal certificate of competency which would be so granted as to be acceptable to all the Provinces.

Another, and a broader suggestion, which grows out of the intimation in reference to Colonial certificates just quoted, is that arrangements might be made with the Imperial Government and other parts of the British realm for a certificate of competency for mine managers which would be accepted in any part of the Empire. Such a certificate would naturally be granted only under conditions which would ensure it being held by experienced and competent men only.

But to confine the matter to Canada alone it seems absurd that the free exchange of experienced managers should be hindered by useless and actually absurd restrictions arising out of the provincial mining laws.

ONTARIO.

Cobalt.—The production of the camp for the first and second month of the year will run much lower than usual as a consequence of the accident to the Cobalt Hydraulic's plant at Ragged Chutes. Some of the smaller mines have had to shut down altogether, while the larger consumers have been running with their own compressor plants, which are not now adequate to their power needs. It is hoped that normal pressure will be resumed by the middle of this month.

At the annual meeting of the Silver Five Mining Company, it was stated that the receipts during the year amounted to $1,707.12 and that there was a balance on hand of $210.97.

On the 200-foot level of the Crown Reserve an ore shoot twice as long and almost as rich as on the 100-foot level, has been opened up. The vein is two and a half inches of 4,000 ounce ore. It is wholly in the Keewatin formation.

According to the statement sent out with the last dividend paid by La Rose Consolidated, that company is now in a better position than ever before, since its inception. The statement reads: Cash in bank, ore in transit, and at smelters, $708,470.99; ore sacked at mine ready for shipment, $303,343.40; total, $1,011,-814.39. Since October, the cash assets have been increased by over 65 per cent.

During the first six months of its existence the Campbell and Deyell sampling plant has milled and treated 3,406.86 tons of ore, the record reading green ore milled and sampled, 2,573.75; ore graded, 833.11; total, 3,406.86. As there were many adjustments to make to the plant at first, this record will be greatly exceeded now that the plant is running well.

Mr. Roy Finucane, son of Mr. T. W. Finucane, vice-president of the McKinley-Darragh-Savage, and Mr. R. W. Robbins, brother of the late manager, have been appointed as manager and superintendent, respectively, of the McKinley-Darragh-Savage.

According to a report from a Boston source, there are 10,000,000 ounces of ore blocked out in the Kerr Lake mine to-day, and favourable ground that has not yet been prospected.. There has been a change in the management of the Kerr Lake, Mr. John Seward being appointed manager temporarily in place of Mr. S. R. Heakes, whose health has broken down.

Owing to the favourable results obtained from sinking on the Hargrave vein in its own territory, the Drummond is now pushing work with better hope of finding more ore than for several years. What appeared to be the top of an ore shoot was cut at the 75-foot level and a shaft is being sunk to cut a more continuous ore body at the lowest level.

The Crown Reserve annual report was more satisfactory than was generally anticipated could be the case a few months ago. The production for the past year was 3,248,196 ounces and to date 9,048,196, while there was a comfortable cash surplus. During the year only 250,000 ounces had been taken from the 100-foot level of the Carson, the remainder being left as a reserve; and altogether the Carson produced a little more than half of the year's output. The mine will either build a mill this year or first company to get into Porcupine, has made the second pay-make a contract with a customs concentrator, which is already proposed.

It is reported that now the Kerry Mining Company has reorganized that it will recommence operations on the Cart Lake lease as soon as it can get air from the Cobalt Hydraulic.

The Crown Reserve has declared its intention of paying monthly dividends. Instead of 15 per cent. per quarter, it will be 2 regular and 3 extra per month.

Before he left to take charge of the Timmins interests in Porcupine, Mr. P. A. Robbins was presented with a very handsome clock by the staff of the McKinley-Darragh-Savage, with which company he has been over two years.

For December the Buffalo mill made a record. It milled 4,154 tons; 125,220 ounces were recovered, with an average head of 36.4 ounces per ton. For the three last months of 1910, 1,303,558 ounces of silver were recovered from 10,484 tons, with an average assay of 36 ounces to the ton.

While Mr. Thomsen, who has the lease on the Green-Meehan, has no definite ore body, yet the drift on the vein at the 100 foot level is looking promising with small flakes of native in the smaltite ore.

On what is known as No. 5 vein, the Beaver has opened up a nice body on a very rich and wide lead. The vein cut at the 200 foot level has been struck again on the 250 foot, and there are now good prospects of blocking out reserves there. The Beaver is now making regular shipments of high grade and seconds.

Thirty feet below the 500-foot level, the Temiskaming has opened up high grade ore in the winze on the No. 3 vein. The vein when sunk on was barren calcite; it changed to smaltite and now shows four or five inches of high grade ore. The cycle of change is exactly the same as at the 300 and 400 foot levels, so that apparently the problem of ore going below the 500 foot level has been solved so far as the Temiskaming is concerned.

It is now definitely announced that arrangements have been made whereby the Black Mines will work the two Coleman properties again in an endeavour to find silver in the big cobalt vein.

South Lorrain, Elk Lake and Gowganda.—The fire that swept Gowganda has destroyed at least half of the town, including many of the hotels and stores. It is not likely that they will build up again.

There is a determined effort on foot to convince the Ontario Government that a railroad should be built into Elk Lake and Gowganda. A deputation representing not only Gowganda and Elk Lake, but investors in the Montreal River country from all over the province, will make a strong plea on February 15.

The Keeley mine has resumed work underground in South Lorrain, 22 men having been obtained from Cobalt to fill the place of the 32 strikers who went out because the management decided to pay on the Cobalt scale.

Having paid off all their indebtedness, the Lucky Godfrey has now resumed operations at Elk Lake. Mr. G. C. Bateman is in charge.

At the annual meeting of the Wettlaufer mines the statement was given out that there was on hand $122,000 cash, and ore reserves of between 3,500,000 and 4,000,000 ounces.

The annual report of the Bellellen Mines shows that the company is in good financial standing and that work is proceeding well. The 7½ tons of high grade shipped netted the company $11,000. Two shafts are being sunk, one on the Little Keeley vein, where there is a solid vein of smaltite and niccolite, and the other at the main shaft.

It is now understood that the shareholders of the Farmers Bank have a claim on the Welsh property at Gowganda, which was sold to the company by ex-Manager W. R. Travers.

The Bartlett has shipped five tons of high grade ore, and other properties in Gowganda are expected to send out further consignments shortly.

Porcupine and Other Gold Areas.—The Scottish Ontario, the ment of $25,000 to the Bannerman syndicate. The vein cut at the 100 foot level shows very uneven assay and Mr. McLaren is now busy making a thorough sampling of the vein.

It is stated that the Porcupine Imperial Mining Company will rush in machinery before the break up of the winter roads.

There are 600 men now staking in what has come to be called the Cripple Creek camp in the Townships of Keefer, Carscallen, and Denton. There is less blanketing going on, but it is almost impossible to prospect with any results with six feet of snow on the ground. There is little free gold, but assays brought down run even and fairly high.

It is stated that the core drill on the Rea Mines at a depth of 40 feet is in $40 ore. The ore body had been stripped for 270 feet before the snow fell.

The Porcupine Gold Mines from its Vipond holding has turned out its first gold bar and it is on exhibition in Porcupine.

Mr. Ben Richards, who did such good work as underground boss at La Rose and Cobalt Lake, has been appointed to the same position for the Hollinger mines at Porcupine.

It is announced that the big mining firm of Bewick, Moreing & Co. will invade the Porcupine field in a few days. Their forerunners have already many claims under option for their engineers to examine when they arrive in the camp.

The past month has been a record one for sales of claims from $5,000 upwards. Buyers are much more eager in canvassing, and sellers are more reasonable. It is stated that never in the best days of Gowganda or Cobalt have payments been made so promptly and unfailingly.

Augustus Heinze has bought the Foster, or rather taken an option on it, and Thompson P. Chester has taken over the Dome Extension for some New York interests. The McIntyre has also been sold, but to whom has not yet been stated.

The T. & H. B. Company has thrown up its option on the Foster-Ellis properties because not enough has been found to justify it in making a further payment. This is about the only case of an important option being thrown up recently.

In North Whitney the finds on the Smith veteran and the Hughes properties have attracted considerable attention.

Excellent progress is being made with the work of getting in machinery and generally preparing for the installation of the machinery at the Porcupine Power Company's site on the Mattagami. One generator has already arrived.

The Pearl Lake Gold Mines, controlled by the Cartwrights, of the Temiskaming Mining Company, has commenced work on the claims.

There now appears little doubt that the Porcupine Railway will be in to the lake by June. The right of way has been cut through, and as there is no rock work the cuts and fills can soon be negotiated by the steam shovel. The line has been definitely located by the Commission on the east side of the lake on a five-mile tangent. There will be a station at Golden City and another at the south end. The townsites on the west side are very disappointed.

Owing to the discoveries on the Day and Hughes properties the Bannerman vein has been definitely located for over two miles, with free gold showings at either end.

That the Porcupine field offers good prospects for the diamond drilling companies is shown by the number that are already operating. The Crown Chartered, the Tisdale, and the Rea Mines are all employing drills to prospect.

The Crown Reserve interests in Porcupine are now employing a good force of men to open up the McEnany claim near the Timmins. Mr. Joe Houston is in charge.

A Duluth syndicate, represented by Mr. A. M. Chisolm, has taken options on properties aggregating 1800 acres in the camp.

Union Abitibi, in the Opasatika region, where there is now a small sized rush, has a stamp mill already on the ground and will set it up this summer and commence operations. The Quebec Government has issued a report that there is telluride in the veins in this section.

The Foley-O'Brian is working three drills on the property now. The main vein shows 18 to 20 feet wide in the crosscut and the assay is said to be good.

Kenora.—The Eagle Lake district is getting a considerable amount of notice, three iron claims on Detour Point are being worked, as well as the claims to be known and incorporated under the name of the Nash Bay Mining Company, upon which work has already been done to the extent of several thousand dollars, and a small mill is on its way there now and will begin operating in the spring.

A contract has been let for $20,000 for diamond drilling over an area in which some very good surface indications have been found, giving hopes of a strong copper lead at some small depth.

The Scovil copper property on Alley Island, the patent for which has been granted and which on the surface gives values of from one to two per cent. native copper, is reported to be on the market now and there are rumours afloat of the absorption of this property by an American syndicate. Nothing definite, however, has as yet been announced.

The Kenora Mines, Limited, which is operating the Mikado Mine on Shoal Lake, is about to increase its capital stock to $1,000,000.

The Secretary-Treasurer's Report of the Prospectors' and Mine Owners' Association of the Kenora Mining Division, given at their third general annual meeting in January, 1911, shows a most successful year for that association. The members appreciated the advantages of belonging to this association so highly that they undertook to double the membership during 1911.

ALBERTA.

Blairmore, Alta., Feb. 1, 1911.—Two fatalities occurred during the month of January at the mine of the Davenport Coal Co. at Burmis. On Jan. 11th Tom Lhink, a driver, was killed by falling between the pit-cars and the rib while rounding a curve. On Jan. 21st Edwin Smith, a miner, was killed by a fall of rock. Smith and his partner were examining their room after a shot when a portion of the hanging wall fell and knocked Smith down the chute. He died a few minutes later.

The Canadian Coal Consolidated, Ltd., is installing a gasoline haulage motor in its mine at Frank, and will test it with a view to equipping the mine throughout with these motors if they prove satisfactory. The system of haulage heretofore used has been a main-and-tail rope in the tunnel and horses in the shaft workings. Gasoline motors have been used with considerable success in some mines in Europe, and operators in this country will watch with much interest to see if they are adapted to local conditions.

BRITISH COLUMBIA.

A number of managers of coal mines being operated in the province recently visited Victoria to make representations to the Government relative to the new Coal Mines Act, which was introduced into the Provincial Legislature late in January. Among them were Messrs. L. Stockett, Hosmer mines; and James Ashworth, Crow's Nest Pass Coal Company's mines, all in southeast Kootenay; W. H. Armstrong, managing director of the Nicola Valley Coal & Coke Company; and representatives of all the producing coal mines on Vancouver Island.

The British Columbia Copper Company is the latest of the metal mining companies operating in British Columbia to declare a dividend. This distribution of profits will be at the rate of ten per cent. per annum if it prove to be a quarterly dividend. Other companies that have lately paid dividends are the Granby Con. M. S. & P. Co., Le Roi No. 2, the Hedley Gold Mining Co., and the Hastings (B. C.) Exploration Syndicate.

The ninth general meeting of the Western Branch of the Canadian Mining Institute, called for February 16th, at Nanaimo, Vancouver Island, will deal chiefly with matters relating to coal mining. A comprehensive paper has been prepared by Mr. C. F. J.

Galloway, B.Sc., on "Coal Mining in British Columbia." This is a carefully made compilation of the main features of numerous official and other reports, and will be an acceptable addition to the available sources of information concerning the coal resources of British Columbia. Another valuable contribution to the proceedings at the meeting will be an address, illustrated by lantern slide views, by Mr. F. Napier Denison, F.R.M.S., of the Meteorological Office, Victoria, on "Earthquake Strains and Stresses in Relation to Coal Mine Explosions." Mr. Denison has for years been making enquiry and observations along lines that point to a connection between the occurrence of earthquakes and explosions in coal mines, and his conclusions are of much interest. There will also be a number of other addresses and papers on coal mining subjects, beside which there will be a demonstration, in a chamber filled with noxious fumes, of men at work wearing Draeger oxygen breathing helmets, designed for mine-rescue purposes.

Nelson.—The company known as the Kootenay Gold Mines, Limited, organized to acquire and operate the Granite-Poorman group of mineral claims is stated to have completed its arrangements for obtaining enough capital to admit of its objects being carried out. The more extensive development of the mines and the enlargement and better equipment of the stamp mill may be expected to be undertaken before long. The early resumption of ore-production at the Molly Gibson mine is looked for, the Consolidated Mining & Smelting Company having had a number of men at work for some time in preparing for this. It is about two years since the shipment of ore from this mine was suspended. The first-class ore will be shipped crude to Trail; later the concentration of the second-class ore at the mill near the mine will be undertaken.

Rossland.—Development and production is being continued at the Consolidated Mining & Smelting Company's Centre Star group on a comparatively large scale. The Le Roi No. 2 Company is also working up to full average capacity of the past two or three years, and the orebodies in its mines promise an output this year probably somewhat larger than that heretofore made. Trail. Nearly 70 tons of ore was shipped from the Nickle Plate Trail. Nearly 70 tons of ore was shipped fro mthe Nickle Plate during January. The Granby Company has commenced to ship to its smeltery at Grand Forks, ore from the Cliff-St. Elmo group, which it is exploring under option of purchase. The Mayflower and Blue Bird, both in the south belt, are reported to be looking well and to give promise of producing a fair quantity of ore this year. It is understood that there is a probability of the Spitzee being operated again ere long, but no definite information in this connection has yet been made public.

Similkameen.—The Hedley Gold Mining Company's operations are the most profitable of any gold mining company in the province. Profits are more than enough to allow of payment of a three per cent. dividend every three months, so an additional distribution of two per cent. has been authorized. The opening of coal mines in the Similkameen country about Princeton, and at Granite Creek, Tulameen, is in progress, and about half a dozen properties may be expected to later become producers. Railway transportation facilities have been provided for part of the district, the V. V. & E. Railway being in operation, giving regular communication with the Boundary country and thence, by the Great Northern Railway, to Spokane. A contributor to the Toronto Monetary Times lately made it appear that Princeton has railway connection (which is a fact) and suggested that extension to Hedley is required. The position is that the railway was first constructed from Osoyoos, near the International Boundary line, to Hedley, and afterwards extended thence to Princeton. A further extension now in progress is from Princeton to Otter flat, in the Tulameen district.

Coast.—While it is not practicable to do effective prospecting work in the Portland Canal district during the winter, excepting on properties where underground workings have been sufficiently advanced to admit of exploration being carried on, notwithstanding that weather conditions are unfavourable for surface work, operations are being continued on three or four of the best known properties. Some disappointment has resulted from the non-realization of expectations that concentrates would be shipped from the Portland Canal Mining Company's mill throughout the winter, but it has lately been announced that no output will be made until steel shall have been laid on the railway from Stewart up BearRiver Valley. The enlargement of the concentrating plant is, meanwhile, being proceeded with. Work is still being done on the Red Cliff copper property, and the Stewart silver gold group, respectively. On Observatory Inlet, the Granby Company has already done about 5,000 feet of diamond drill work, and reports are to the effect that this prospecting has proved encouraging, but it is unlikely any decision will be arrived at relative to the purchase of the Hidden Creek Company's mine, held under option, until next summer. During the four or five months that shall intervene, much additional exploration of the property will be carried out, so that the extent of the orebodies may be further determined and more information as to their value be obtained.

On Texada Island, the Tyee Copper Company is doing development work in the Cornell mine, the lease of which has been transferred to this company by the Northern Texada Mining Company. The Marble Bay mine is being opened at the 1250 foot level, 100 feet deeper than the last level, from which a considerable output of bornite ore, containing gold and silver as well as copper, has been made. The expected re-opening of the copper and iron mines on the property of the Puget Sound Iron Company has not yet taken place, but there is some probability of a move being made next spring.

Coal mining continues active, the producing mines of Vancouver Island are gradually increasing their output of coal. The prospects are that the tonnage for 1911 will be considerably larger than that of any other year since coal mining assumed important proportions on Vancouver Island.

GENERAL MINING NEWS.

NOVA SCOTIA.

Stellarton, February 3.—William Newcombe, a native of Halifax, was killed at Albion Mines this morning while unloading a car of pit props.

Sydney, February 6.—Sir Henry Pellatt and C. Hugh Brown are here. Sir Henry is paying his first visit to the Dominion Steel & Coal plants, in which he is financially interested. Mr. Brown has been the confidential adviser of some of the greatest financial corporations in the United States. Both are very free in their expression of opinion about the certainty of industrial development here.

ONTARIO.

Ottawa, February 1.—Mr. M. J. Butler, of the Steel Corporation, is here to urge the renewal of the bounty on rods, which expires in June.

"We have had a most successful year," said Mr. Butler. "At the present time we are turning out 800 tons of pig iron a day. Our output of steel per month is now 26,500 tons, our output of rails 13,000 tons, and our output of rods from 8,000 to 9,000 tons. The rail market at the present time is in an exceptionably healthy condition, owing to the construction of so many different lines in Canada. At the present time we have three cargoes of rails

on the way from Sydney to Prince Rupert. These cargoes are going around 'the Horn.'

"About 3,000 men are now employed on the steel plant at Sydney, and about 1,500 more are employed by the company getting out iron ore in Newfoundland and limestone at the various quarries in Cape Breton. The coal branch is now employing 6,000 men, but next summer this number will be increased to 8,500."

Mr. Butler declined to be quoted on the new tariff agreement. It was stated by another Sydney man now in the city, however, that the renewal of the eight cents a ton duty on coal means a loss to the Dominion Corporation of $120,000 a year. This argument may be used by the steel and coal interests in urging a renewal of the bounties.

Toronto, January 30.—A consignment of 100 bars of silver valued at $30,000, passed through Toronto Saturday billed from Cobalt to Newark, N.J.

Elk Lake, February 2.—Following the recent enthusiastic meetings here and at Gowganda, it has been arranged that a strong delegation will go to Toronto to meet the members of the Ontario Cabinet and urge the immediate necessity for a railroad to Elk Lake and Gowganda.

Contingents from Montreal, Ottawa, Cobalt, Haileybury and New Liskeard have signified their intention to join with the Montreal River deputation in impressing upon Premier Whitney and his colleagues the fact that the time is opportune for the affording of better facilities to the Gowganda district, which it is felt the wealth and permanent nature of the camp warrant.

With better railway access there are many new properties which will be at once placed on a highly paying basis.

Porcupine, February 2.—Following immediately upon the departure of Messrs. Heinze and Scott, came A. M. Chisholm, of Duluth, Min., accompanied by a party of mining men and others, who will be associated with him in what is said will be one of the largest prospecting undertakings ever inaugurated in the district.

Porcupine, February 3.—Close upon the consummation of the big deal for the Gray claims in the Ogden comes the report of another in the same township, the eight claims involved lying southeast of the Gray group and about a half-mile directly south of the Weston group, the purchase of which is still under consideration by interests who have been negotiating with the owner for their disposal.

BRITISH COLUMBIA.

Phoenix, February 4.—The Granby Company continues its search for new properties with a view to enlarging its field of activity. During the past few days they have secured options on 50 mineral claims on Copper Mountain, northeast of Chesaw, Wash., involving an ultimate purchase price of about $100,000.

E. E. Campbell, assistant engineer of the Granby Mines, and W. J. Mitchell, diamond drill expert, have spent some time at the properties considering the problem of getting in necessary machinery, sites for boilers and drill equipment in order to commence development work early in the spring. Arrangements are now being made for the transfer of the machinery to the mountain, while the heavy hauling may be done on sleighs.

Stewart.—The news of the week in mining circles is the commencement of shipping by the Portland Canal mine. From three to four hundred tons of concentrates are now being hauled down to the railway preparatory to shipment to either the Ladysmith or Tacoma smelters. Plans are now being made for the enlargement of the mill, bringing the capacity of treatment up 75 tons. This will necessitate the temporary closing of the plant pending alterations and installations of new tables. Manager Elmendorf announces that everything will be ready for the resumption of treatment when steel reaches the mill-site.

Red Cliff.—The incline raise started 1,000 feet in from the portal of the main tunnel is now up some 75 feet in an excellent grade of copper ore. A crosscut is also being driven in a westerly direction.

Stewart.—A new ore shoot has been struck in the face of the No. 4 tunnel at a point 220 feet from the winze. The winze is down 25 feet, following an 18-inch vein of solid galena and iron sulphides, assaying $50 to the ton. In the face of the East drift on the No. 3 tunnel, the high grade still maintains its persistence, showing native silver and argentite in noticeable quantities.

Development is also proceeding satisfactorily on the Main Reef, O. K., International, Ben Bolt, and Mt. Gladstone properties.

MINING NEWS OF THE WORLD.

SOUTH AFRICA.

Johannesburg.—A private cablegram from Johannesburg states that during December the mines of the Rand alone (i.e., excluding outside mines) crushed 1,827,423 tons, the average yield per ton being 28s. 1d., the working costs per ton 17s. 9d., the profit per ton 10s. 5d., and the aggregate profit £952,574.

RHODESIA.

The value of the Rhodesian gold output for last year is announced as £2,569,200, which represents a decrease of about £54,500 compared with 1909, but an increase of nearly £43,000 when contrasted with the 1908 return. It is authoritatively explained that the slight decrease is accounted for by the fact that a large number of properties which were worked on a small scale by individuals have been taken over by companies, and crushing has temporarily ceased pending development and the erection of up-to-date machinery. At the same time the exceptionally large outputs made by the Globe and Phoenix mines should not be forgotten. In October and November last this mine was largely responsible for the Rhodesian output rising to £234,920 and £240,570 respectively, the latter total establishing a fresh monthly record. Last month's drop to just under the £200,000 mark is also accounted for by the mine named, its production having fallen back to a more normal level, the object of the management in temporarily raising the returns having been attained.

The total output of gold from Rhodesia for the month of December is cabled as 47,367 ozs., valued at £199,500, as against 57,158 ozs., valued at £240,573, in the previous month. This is a decrease on the month of 9,791 ozs. There were 159 gold producers last month. The output of other minerals for last month was: Silver, 15,117 ozs.; lead, 57 tons; coal, 13,615 tons; chrome ore, 5,526 tons; asbestos, 25 tons.

UNITED STATES.

New York, February 3.—Conditions prevailing in the copper market are reported to be materially better and the quotation has been firmly established on the basis of 12½c. for electrolytic.

It is stated that sales Tuesday afternoon and Wednesday were in the neighbourhood of 25,000,000 to 30,000,000 lbs., the major portion of which was for European account.

New York, February 4.—Conditions governing the petroleum export market for the year 1910 have been eventful to producers and refiners here and in foreign markets the world over. The extraordinary increase in the world's production of petroleum, which stimulated keen competition by an effort to find an outlet for the enormous supply, led to sharp successive cuts in prices for illuminating oil, for export.

Los Angeles, Cal., February 4.—The most important development in the oil fields during the past month has been the sudden activity displayed by the Standard Oil Company. The great corporation is quietly buying all the light oil it can secure in the Midway, Maricopa, and other San Joaquin Valley fields, and is also closing contracts for this grade of oil at Fullerton. Some of the contracts being closed with producers by Standard people

provide for prices ranging from 45 to 65 cents per barrel at the wells, depending on the grade of the product.

Tonopah, Nev., February 4.—The regular semi-monthly clean-up of cyanide precipitates at the Tonopah Extension mill, covering the first half of January, has been completed and resulted in the production of 13 bars of bullion, weighing 1,705 pounds, and valued at $18,000.

Washington, January 30.—The public lands committee of the House concluded to-day on Representative Mondell's bill to regulate the leasing of coal lands in Alaska. Many interests, including Alaskan railroad and financial interests, have appeared before the committee in reference to the measure. Director George Otis Smith, of the Geological Survey, and Delegate Wickersham, of Alaska, were present.

MEXICO.

Mexico City.—The Transvaal Copper Company has developed an enormous body of ore upon its properties in the Cumpas district, Sonora. Diamond drills were used during 1910 with good results, the total work amounting to more than 5,000 feet. One ore body 90 feet thick and running 6 per cent. copper, was penetrated. An important thing recently accomplished was the unwatering of the Verde shaft. The company holds 2,996 acres of mineral-bearing land, two ranches, which aggregate 41,000 acres, a smelter site at Cumpas embracing 50 acres, upon which is located a 150-ton blast furnace and a 20-ton reverberatory furnace.

COMPANY NOTES

LE ROI NO. 2.

For the last three years the dividends of Le Roi No. 2 have been at the same rate—namely, 6 per cent. per annum. The profits of the last two years, however, have come out at appreciably less than those of the preceding period. The total for the year ended 30th September last is just sufficient to provide the dividends distributed, and as a further £5,000 is added to the reserve, raising that fund to £20,000, the carry forward has become reduced by a corresponding amount. An exceptionally large sum—£21,000—was last year expended upon development, £19,500 being charged against revenue. In 1908-9 some £14,500 was disbursed under this head and £12,500 written off. We contrast below the results of the past three years:

	1909-10	1908-9	1907-8
Gross receipts	£105,946	£114,424	£128,765
Expenses, taxes, etc.	59,295	65,040	75,712
Net profit	8,944	49,384	54,053
Dividends, etc.	37,707	37,700	37,800
To reserve	5,000	5,000	10,000
Brought forward	36,397	29,713	24,460
Carried forward	31,404	36,397	29,713
Ore shipped (tons)	29,776	29,874	29,648
Yield—Gold (ozs)	26,447	28,353	28,453
Silver (ozs)	24,078	22,401	20,489
Copper (lbs)	970,996	956,812	910,384

The quantity of ore shipped to the smelters was last year just a shade less than for the preceding period, the gold contents being lower by some 2,000 ounces, the silver higher by 1,600 ounces, and the copper by 14,000 lbs. A larger tonnage of low grade ore was treated at the mine, producing 1,368 tons of concentrates, value $29.28 per ton, at an average cost, including smelting charges, of $18.6 per ton. These figures are stated to show an advanced improvement, while the percentage of gold recovered is greater than for any previous year. Twelve months ago an interesting question in connection with the mine was as to whether the valuable vein worked by the Consolidated Mining Company extended into the Surprise claim of Le Roi No. 2. It would appear from the manager's report that the drilling done did not result in the discovery of any new veins. So far as opened up at the 1,300 feet level, the extension of the south vein of Le Roi Company has yielded little of importance. The position of the mine is considered to be much the same as a year ago, although there are indications of the discovery of further ore bodies at no very distant date.

HARGRAVES MINING COMPANY.

The annual meeting of the Hargraves Mining Company was held on February 8th. The report showed receipts for the year from sales of bullion, etc., of $71,148.54, which, added to the cash on hand on Dec. 31, 1909, of $31,273.02, made a total of $102,421.56. Expenditures during the year were $58,800.73, leaving a cash balance in the bank of $43,620.83. Ore on hand and at smelters is valued at $37,612, making practical cash assets at the end of 1910 of $81,232.83. Total production during the year was 635 tons, of a gross value of $117,400.74.

CEMENT COMPANY ANNUAL.

The annual meeting of the Canada Cement Company will be held at the Windsor Hotel, Montreal, February 21, at 3 p.m.

CROWN RESERVE.

Dividend No. 12.

Notice is given that a monthly dividend of 2 per cent. for the month of January, 1911, and a bonus in addition of 3 per cent. for the same period, making a total payment of 5 per cent., has been declared and will be payable on the 15th February, 1911, to shareholders of record the 31st January, 1911. Transfer books will not be closed. Dividend cheques will be mailed on the 14th February, by the transfer agents, "The Crown Trust Company," and shareholders are requested to advise them of any change of address.

DOMINION STEEL CORPORATION.

A circular letter has been issued by the Dominion Steel Corporation announcing that the date for closing the accounts of the company has been changed from December 31, to March 31, the change being made in order that the accounts and reports of the Coal Company and those of the Dominion Iron & Steel Company may be presented to shareholders of both companies and to the shareholders of the Dominion Steel Corporation at the same time.

The next statement of the Coal Company will accordingly cover a period of 15 months and the Steel Company's statement one of 10 months. The combined earnings of the two companies for the period after the payment of all fixed charges will, it is understood, show about 5 per cent. earned on the common stock, which is represented by the stock of the consolidation. The expenses incidental to the coal strike are estimated at $450,000, or equivalent to 1⅛ per cent. on the stock, and the loss from the reduction of steel bounties is placed at $250,000.

MARITIME COAL, RAILWAY AND POWER CO.

A meeting of the directors of the Maritime Coal, Railway & Power Company, Limited, was held on January 25th, at the head office in the Ottawa Bank building, Montreal. It was resolved to build additional packets to facilitate water shipments of coal from the new slope at Joggins. It was resolved to open another colliery at St. George in the eastern part of the company's areas, for the further development of the property and increase the output. A ten years' lighting contract with the town of Amherst was approved and executed.

STATISTICS AND RETURNS

COBALT ORE SHIPMENTS.

Following are the shipments from the Cobalt camp for the week ending January 28, and those from January 1, 1911, to date:

	Jan. 28. Ore in lbs.	Since Jan. 1. Ore in lbs.
Beaver	122,910	186,410
City of Cobalt	.....	60,000
Crown Reserve	115,540	219,740
Chambers-Ferland	64,000	128,900
Hudson Bay	61,240	61,240
La Rose	68,480	344,090
Kerr Lake	120,330	421,233
McKinley-Darragh	83,160	462,660
Nipissing	451,130	1,009,010
Peterson Lake (Little Nip.)	58,430	58,430
Right-of-Way	68,020	128,880

The shipments for the week were 1,273,240 pounds, or 636 tons.

The shipments from January 1 to January 28 were 4,305,203 pounds, or 2,152 tons.

Following are the shipments from the Cobalt camp for the week ending February 3, and those from January 1, 1911, to date:

	Feb. 3. Ore in lbs.	Since Jan. 1. Ore in lbs.
Beaver	.....	186,410
Buffalo	60,900	245,570
Chambers-Ferland	.....	128,900
City of Cobalt	.....	60,000
Cobalt Lake	.....	131,400
Cobalt Townsite	.....	249,740
Coniagas	215,800	504,450
Crown Reserve	.....	219,740
Hudson Bay	.....	61,240
La Rose	237,240	581,330
Kerr Lake	.....	421,223
McKinley-Darragh	50,960	513,620
Nipissing	62,200	1,071,210
O'Brien	.....	79,200
Peterson Lake (Little Nip.)	.....	58,430
Right-of-Way	64,670	193,550
Silver Cliff	.....	47,920
Temiskaming	75,465	221,285
Trethewey	42,000	139,250

The shipments for the week were 809,265 pounds, or 403 tons.

In 1910 the shipments amounted to 34,420 tons; in 1909, they were 30,096 tons, valued at $12,456,301.

BRITISH COLUMBIA ORE SHIPMENTS.

The following are the returns of the ore production and movement for the past week ending January 21st and for the year to date:

Boundary Shipments.		
Granby	21,881	66,434
Mother Lode	6,498	22,022
Snowshoe	1,730	5,445
Rawhide	5,742	12,903
Jack Pot	413	1,242
Number Seven	107	258
Other mines	.....	240
Total	36,371	108,544
Rossland Shipments.		
Centre Star	3,836	11,022
Le Roi No. 2	339	1,343
Le Roi No. 2 milled	300	900
Le Roi	277	719
Other mines	.....	74
Total	4,752	14,058
Slocan-Kootenay Shipments.		
Sullivan	152	1,251
St. Eugene milled	2,775	8,325
Richmond-Eureka	99	216
Ruth	33	69
Rambler-Cariboo	61	175
Hewitt	22	69
Queen milled	420	1,260
Granite-Poorman milled	250	750
Nugget milled	110	330
Wilcox milled	75	225
Emerald	42	142
Standard	59	122
Society Girl	62	96
Silver Bell	14	14
Utica	21	21
Beatrice	29	29
Other mines	.....	346
Total	4,224	13,440

The total shipments for the week, including the estimated milling, were 45,347 tons, and for the year to date, 136,042 tons.

B. C. COPPER CO.'S RECEIPTS.

Greenwood, B.C.

Mother Lode	6,498	22,022
Rawhide	5,742	12,903
Jack Pot	413	1,242
Other mines	.....	240
Total	12,653	36,407

GRANBY SMELTER RECEIPTS.

Grand Forks, B.C.

Granby	21,881	66,434

CONSOLIDATED CO.'S RECEIPTS.

Trail, B.C.

Centre Star	3,836	11,022
Snowshoe	1,730	5,445
Sullivan	152	1,251
Le Roi No. 2, part con.	339	1,343
Le Roi	277	719
Number Seven	107	258
Richmond-Eureka	99	215
St. Eugene	127	307
Ruth	33	69
Rambler-Cariboo	61	175
Hewitt	22	69
Standard	59	122
Emerald	42	142
Society Girl	62	96
Queen concentrates	75	75
Granite-Poorman con.	42	42
Silver Bell	14	14
Utica	21	21
Beatrice	29	29
Other mines	.....	420
Total	7,127	21,835

The total receipts at the smelters for the week, including concentrates, were 41,661 tons, and for the year to date, 124,676 tons.

BRITISH COLUMBIA COPPER RECORD.

The British Columbia Copper Company wound up the calendar year 1910 with the best monthly production ever made—973,700 pounds of copper, which brought the year's total up to 9,411,290 pounds.

UNITED STATES PETROLEUM PRODUCTION.

The annual official report on the production of petroleum in the United States for 1909 has just been published and shows that the quantity obtained amounted to 182,134,274 barrels, as compared with 178,527,355 barrels in the previous year. With regard to the production of individual States, California was easily first, with Oklahoma and Illinois second and third respectively. Consumption of oil fuel by the railroads is steadily advancing and for the year reached a total of 19,939,394 barrels, against 16,889,070 barrels in 1908. Referring to the introduction of oil fuel into the United States Navy, the report states that it has been quite as rapid, and with fully as good results as had been anticipated.

TORONTO MARKETS.

Feb. 9th (Quotations from Canada Metal Co., Toronto):

Spelter, 5.60 cents per lb.
Lead, 3.65 cents per lb.
Antimony, 8 to 8½ cents per lb.
Tin, 44 cents per lb.
Copper, casting, 13.25 cents per lb.
Electrolytic, 13.25 cents per lb.
Ingot brass, 8 to 12½ cents per lb.

Feb. 9th—Pig Iron (Quotations from Drummond, McCall Co., Toronto):

Summerlee No. 1, $23.00 (f.o.b. Toronto).
Summerlee No. 2, $22.50 (f.o.b. Toronto).
Midland No. 1, $20.00 (f.o.b. Toronto).
Midland No. 2, $19.50 (f.o.b. Toronto).
Hamilton No. 1, $18.75 (f.o.b. Hamilton).
Hamilton No. 2, $18.25 (f.o.b. Hamilton).
Clarence, $20.00 (f.o.b. Toronto).
Cleveland, $20.00 (f.o.b. Toronto).

GENERAL MARKETS.

Coal, anthracite, $5.50 to $6.75.
Coal, bituminous, $3.50 to $4.50 for 1¼ inch lump.

Coke.

Feb. 7th—Connellsville Coke (f.o.b. ovens).

Furnace coke, prompt, $1.40 to $1.50 per ton.
Foundry coke, prompt, $2.00 to $2.15 per ton.

Feb. 7th—Tin (Straits), 41.00 cents.

Copper, prime lake, 12.70 cents.
Electrolytic copper, 12.40 to 12.50 cents.
Copper wire, 14.00 cents.
Lead, 4.50 cents.
Spelter, 5.65 cents.
Sheet zinc (fo.b. smelter), 7.50 cents.
Antimony, Cookson's, 8.25 cents.
Aluminium, 21.75 to 22.00 cents.
Nickel, 40.00 to 45.00 cents.
Platinum, ordinary, $38.50 per ounce.
Platinum, hard, $41.00 per ounce.
Bismuth, $2.00 to $2.10.
Quicksilver, $42.00 per 75 lb. flask.

SILVER PRICES.

	New York. cents.	London. pence.
January 21	53	24½
" 23	53	24½
" 24	53¼	24 9/16
" 25	53¼	24 9/16
" 26	53	24½
" 27	52⅞	24 7/16
" 28	52⅞	24 7/16
" 30	52¾	24⅜
" 31	52¾	24⅜
February 1	52¾	24⅜
" 2	52¾	24 5/16
" 3	52⅝	25¼
" 4	52⅝	24¼
" 6	51¾	23⅞
" 7	52	24

SHARE MARKET.

(Courtesy of Warren, Gzowski & Co.)

Miscellaneous, February 9th, 1911.

	Bid.	Ask.
Amalgamated Asbestos	10	..
Black Lake Asbestos	15	15½
Dominion Coal	..	..
Dominion Steel	..	..
Dominion Steel Corp.	58¾	59
Granby	35	37
Consolidated Mining	45	50
Nova Scotia Steel	97	..
Crow's Nest Pass	..	77

Cobalt Stocks.

Amalgamated	.03	Sellers
Bailey	.05¼	.06
Beaver Consolidated	.36	.36⅛
Buffalo	2.00	2.30
Chambers-Ferland	.12⅞	.13¼
City of Cobalt	.19	.21
Cobalt Central	.09½	.10
Cobalt Lake	.15	.15¼
Coniagas	6.60	6.75
Crown Reserve	2.64	2.70
Foster	.05	.07
Gifford	.02	.03
Great Northern	.10¾	.11½
Green Meehan	.01½	.02
Hargraves	.19¾	20½
Hudson Bay	1.05	1.15
John Black	.01	.02½
Kerr Lake	7.00	7.25
La Rose	4.88	4.90
Little Nipissing	.06¼	.06⅜
McKinley	1.61½	1.62
Nancy Helen	.02	.04½
Nipissing	10.90	11.00
Nova Scotia	.14	.16
Ophir	.08	.12
Otisse	.01½	.01¾
Peterson Lake	.14	.14½
Right of Way	.14	.14¼
Rochester	.03⅜	.03½
Silver Leaf	.05¼	.06¼
Silver Bar	...	...
Silver Queen	.02	.05
Temiskaming	.88⅛	.88⅞
Trethewey	1.08	1.12
Watts	.05	Sellers
Wettlaufer	1.02	1.05
Hollinger	4.50	4.51

New York Curb.

British Columbia Copper	06⅝	06⅞
Butte Coalition	18¼	19
Chino Copper	22	22⅛
Davis-Daly Copper	01¼	01½
Ely Consolidated	33	35
Giroux Mining	06½	06 9/16
Goldfield Consolidated	06⅝	06¾
Greene-Canadian	06⅜	06½
Harcuvar Copper	02	03
Inspiration Copper	08 1/16	08 3/16
Miami Copper	20¼	20½
New Baltic Copper	...	...
Nevada Con. Copper	19	19⅛
Ohio Copper	01 11/16	01 13/16
Rawhide Coalition	03	04
Ray Central	01 9/16	01⅝
Ray Consolidated	17⅝	17⅞
Union Mines	5/16	⅜
Yukon Gold	04	04⅛