

# THE CANADIAN MINING JOURNAL

VOL. XXXIV.

TORONTO, October 15, 1913.

No. 20

## The Canadian Mining Journal

With which is incorporated the

"CANADIAN MINING REVIEW"

Devoted to Mining, Metallurgy and Allied Industries in Canada.

Published fortnightly by the

### MINES PUBLISHING CO., LIMITED

Head Office - - - 2nd Floor, 44 and 46 Lombard St., Toronto

Branch Office - - - - - 34B Board of Trade Building

London Office - - - Walter R. Skinner, 11-12 Clement's Lane  
London, E.C.

U. S. A. Office - Ward & Smith, 931 Tribune Building, New York

Editor

REGINALD E. HORE

**SUBSCRIPTIONS**—Payable in advance, \$2.00 a year of 24 numbers, including postage in Canada. In all other countries, including postage, \$3.00 a year.

Advertising copy should reach the Toronto Office by the 8th, for issues of the 15th of each month, and by the 23rd for the issues of the first of the following month. If proof is required, the copy should be sent so that the accepted proof will reach the Toronto Office by the above dates.

#### CIRCULATION.

"Entered as second-class matter April 23rd, 1908, at the post office at Buffalo, N.Y., under the Act of Congress of March 3rd 1879."

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## ONTARIO MINERAL OUTPUT INCREASING

The report of production of Ontario mines and works for the first half of the year, prepared by Mr. T. W. Gibson, Deputy Minister of Mines, shows notable increase in total output of metals. There was a slight decrease in silver from Cobalt district; but a large increase in gold from the Porcupine mines. The satisfactory condition of the nickel industry is told by the substantial increase in output of Sudbury mines.

For several years Ontario's total output has shown an increase, and 1913 bids fair to set a new record.

The Cobalt district may be expected to yield less silver than in 1912, and unless some remarkable discoveries are made, there will be a further falling off next year. The very rich ore forms a smaller and smaller percentage of the production of the district. It is to be expected, however, that Cobalt will be a very large producer of silver for many years to come.

The Porcupine district is by far the most important producer of gold that has yet been found in Ontario. 1913 will go on record as the first in which Ontario has produced a very large amount of the precious metal. Next year there will probably be a considerably larger production, provided, of course, that labour troubles are avoided.

There is also good reason to expect an increase in output of nickel and copper, as the operating companies are finding a satisfactory market and are preparing to enlarge their plants.

The output of iron is still small, but has increased greatly during the past few years.

## THE GEOLOGICAL CONGRESS EXCURSIONS

It was expected from the announcements describing the excursions to be taken during the summer, that these trips would prove of extraordinary interest to both visiting geologists and to Canadians. Such proved to be the case. Places of special geological and mining interest all across the continent were visited under unusually advantageous conditions. The Dominion and Provincial Governments aided liberally and the transportation companies did their part in a way which won for them much praise.

To the Department of Mines of Canada and to the mining departments of the governments of Ontario, British Columbia, and Quebec belongs most of the credit. The numerous members of these several departments all assisted. Mr. W. S. Lecky, secretary of the Congress, did an enormous amount of work, and did it well. President F. D. Adams, Dr. A. E. Barlow,

Dr. A. P. Coleman, H. E. T. Haultain, G. G. S. Lindsey, J. McEvoy, Dr. W. A. Parks, J. B. Tyrrell, T. L. Walker and several others shared the work with the government officials.

The members who visited Canada for the first time were apparently much surprised to find our country so large and our resources so great. Those who have been here before were amazed at the wonderful growth of the past few years. These men will return to their several countries to tell what they have seen and Canada will be better known to the large number of men reached by the reports of our distinguished visitors.

To the Canadian geologists the comments of the visitors on what they saw, the descriptions of similar phenomena in other places and the theories advanced to explain them proved very interesting and useful. Large numbers of specimens were gathered and carried home to laboratories in several parts of the world. The study of these and of the literature and the new interest which the visitors now have in Canadian geology will all help us to interpret the geology of our country. The guide books and maps prepared for the excursions are in themselves a very important contribution to the literature, and will long be useful to those who visit the chief points of interest along the main lines of the railroads and in the mining camps.

### WESTERN FEDERATION STRIKE IN MICHIGAN

The Michigan copper mines are again in operation; but with reduced forces. A few of the mines which were having considerable difficulty in making receipts equal expenditures are still idle, and will probably not be worked for some months. The members of the Western Federation of Miners still refuse to go to work, and the miners at work are all non-union men.

The output of copper is as yet far from normal, but the production shows a gradual though slow increase. The Calumet and Hecla Mining Company has a large number of men at work. The other companies have a comparatively small percentage of their usual working force, and some mines are only able to make a very small daily output.

It is evident that the mines can be operated without the union members and, if the law is enforced, they will be. Since the laws do not compel the operators to recognize the officers of the union as representatives of their employees, the strikers are endeavouring to gain their ends by ignoring the laws. In this they have received considerable encouragement from the actions of the civil authorities.

Every day strikers have endeavoured to prevent miners from going to work. Sometimes they do so by peaceable means, by arguments and by parades made for the purpose of impressing the public with the number of men on strike. To such methods there can be little objection, as everyone recognizes that the strikers should be permitted to use any reasonable means of adding to their numbers.

Frequently, however, and almost daily, the strikers resort to violence and to intimidation by threats. Day after day the workmen have been subjected to insults. Serious conflicts have been time and again averted only by the activity of the soldiers and deputies. Scores of arrests have been made; but, in spite of the fact that the men were taken in the act, nearly all have been freed without punishment. Every such case encourages the strikers to commit further disorders and they are apparently beginning to believe that the laws will not be enforced against them. Recognizing that the local authorities were unable to cope with the situation, Judge O'Brien issued an injunction prohibiting interference with the workmen. A few days later, however, he dissolved it on a technicality and then refused to grant a restraining order to prevent violence and intimidation by threats.

The strikers during the period that the injunction was in force, were comparatively quiet and the workmen were not seriously annoyed. Within a few hours of the dissolution of the injunction, however, the disorder broke out again. The strikers were apparently under the impression that the dissolving of the injunction meant also that the common law was suspended. The workmen were again subjected to forcible interference. Men unconnected with either party were fired on while passing on the public highway. A party of mine guards was met by a fusillade of shots. Finally, last week, one of the deputies was murdered.

Fortunately at this stage the Supreme Court of Michigan ordered Judge O'Brien to show why an injunction should not be issued and in the meantime to put it into force. It is hoped that this action will prevent serious bloodshed.

Throughout the strike there has been practically no discussion of grievances. It is merely a struggle between the owners of the properties and the officers of the Western Federation of Miners. Naturally the owners wish to run their own properties.

The strikers have grievances. They want higher wages, shorter hours, and improved conditions. Some do not want to use the one-man drills.

The average wage paid in Michigan copper mines is comparatively low. A common wage is from \$70 to \$80 per month. There are, of course, many miners making higher wages. Many of those using one-man drills make over \$4, and some over \$5 per day. It is rather peculiar that a demand for higher wages should be made along with one for the abolition of the one-man drill.

Many of the men employed in the copper mines have had very little or no previous experience as miners. Considering their lack of experience it is not surprising that they do not receive high wages. Men of this class are chiefly employed as trammers and earn about \$65 per month. The work is hard; but rests are frequent. Industrious trammers of good physique after a little experience receive much higher wages. Some average \$90 per month.

In a recent statement, President Agassiz says that the pay rolls of the last full month of the Calumet and Hecla show that the miners were receiving an average wage of

\$3.66, and the trammers \$2.89 net after deductions for medical assessment, etc.

While the wages are lower than in many mining districts, there are advantages which offset this to a considerable degree. The mines are worked regularly, even in periods when the price of copper is very low. The mines are dry and well ventilated. The companies provide houses at low rentals, good schools, hospitals and libraries. Some men do not place a high value on these things, however, and in making comparisons neglect them altogether. They want to make a lot of money by working hard and are willing to live under less favourable conditions in order to attain their end. To such men especially do the wages seem low.

As a matter of fact, men who are willing to work hard are able to earn very high wages by using a one-man machine and working on contract. If they are given two-man machines and less industrious or less experienced partners they cannot make as good wages. Neither man works as hard and the one heavy machine cannot do nearly as much work as two light machines in the character of rock that is being mined in Michigan.

The contention of the strikers, or rather of the officers of the Western Federation, is that there should be a minimum wage, and that the one-man drill be abolished. This is equivalent to asking the managers to ignore the differences in ability of the workers and to pay wages according to number of men employed rather than to amount of work done. Such practice would evidently soon lead to financial ruin, and the mine managers are not likely to make any such agreement with the Federation or with anyone.

The wages paid must depend largely on the profits from mining. The profit depends on the price of copper and on good management. To keep down the costs the managers are constantly endeavouring to find better machines and better methods. The adoption of these results in larger profits and, therefore, in the possibility of increasing wages. It is the desire of all managers to reduce the hours of labour and increase the wages. To do this in the face of a low price for the product means that there must be increase in efficiency. When the strikers realize, as the men at work realize, that the interests of employer and employee are the same, they will have made a real step forward in their campaign for a larger return for their labour.

### IRON DEPOSITS OF QUEBEC

The Bureau of Mines of the Province of Quebec has in preparation a work by Mr. E. Dulieux describing the iron ore deposits of the province and their possible utilization. In the reports on mining operations for the years 1911 and 1912, Mr. Dulieux describes most of the deposits and this work will furnish the basis for the more elaborate report.

The iron production of Quebec in recent years has been very small. A little bog iron ore has been mined and used in local furnaces; but the report for the year 1912 shows no production whatever.

It is to be hoped that the publication of Mr. Dulieux's monograph will direct more attention to the ore deposits.

### WESTERN OIL AND GAS FIELDS

A memoir is being prepared by Wyatt Malcolm, of the Geological Survey, to lay before the public what is known regarding the oil and gas possibilities of the north-western provinces of Canada.

There are large areas of formations in which oil and gas may be reasonably expected to exist. Comparatively little has yet been done to test the possibilities.

There are a few areas already proven. At Medicine Hat and Bow Island gas has been found in paying quantities. Prospecting for oil has as yet met with little success.

The development of the West is creating a splendid market for oil and gas. The gathering together of all the available knowledge will aid exploration and will be much appreciated by those who are searching for commercial deposits.

### MINE TAXATION

One of the leading topics for discussion at the meeting of the American Mining Congress at Philadelphia during the week of October 20 will be taxation laws for mines. Colorado, Arizona, Pennsylvania, and Michigan have new systems of taxation. Many mining men claim that they are overtaxed under the new systems and considerable airing of views is expected.

The system of taxation introduced by J. R. Finlay in his appraisal of the mines of Michigan resulted in much criticism; but in a re-appraisal of the mines in 1913, Mr. R. C. Allen, Director of the Michigan Geological Survey, has shown that the system, modified somewhat, is reasonably fair to the mine owners if the appraiser has time to acquire an intimate knowledge of the character of the ore bodies and the costs of mining and marketing the ore.

Mr. Finlay bases his calculation on three factors: average cost, present prices, and an estimate of future life. The third factor is determined partly by developed ore and partly by assumption of continuance of known ore bodies beyond the bottom levels of the mines. The assumption for continuance is based mainly upon the extent to which the continuity of the deposits has been proven for the district and for the type to which the mine belongs.

The third factor to be properly applied must be used only after careful study of the structural features of the ore bodies. The Michigan Tax Commission has consequently asked the Director of the State Geological Survey to make the estimates. During the past summer this has been done in the Michigan iron districts and the results are regarded as very satisfactory.

It is intended that the Geological Survey shall annually revise the estimates. The revision, compared with the first estimate, will be comparatively simple, and a more accurate record will be obtained than is possible by the more costly special commissions.

## HOLLINGER DIVIDENDS

Hollinger Gold Mines, Limited, in the period January 1 to September 9, of this year, made a profit of \$1,139,267. Shareholders have during the past year received \$1,170,000. The mine is reported to be in good condition and the cost per ton has been lowered.

The good record of the Hollinger is all the more noteworthy because of the fact that operations were seriously interfered with for some months by a strike ordered by officers of the Western Federation. The strike was quite unsuccessful; but the industry suffered considerably from the activities of the agitators.

## MINING WORLD INDEX

The publishers of the Mining and Engineering World, Chicago, have issued the third volume of an index which has proven very useful to those who have occasion to refer to the literature on mining subjects. This third volume covers the half-year period, January to July, 1913. The compilation of such an index means a great amount of work, and the editors are to be congratulated on its comprehensive character, simplicity of arrangement and early appearance. For ready reference to the current literature it is invaluable.

## COPPER ORE IN ALBERNI DISTRICT, B.C.

Copper ore in Alberni district is to receive attention, the Ptarmigan Mines Co. having been organized to prospect and develop mineral claims in the vicinity of Great Central Lake. Seven years ago Mr. Herbert Carmichael, Provincial Assayer and Assistant Provincial Mineralogist, visited that part of the island and made a report which was printed in the Annual Report of the Minister of Mines for 1906. The following was his introductory account of what he saw there: "Considerable bodies of ore having been reported to exist at the head of Great Central Lake, Alberni district, it was decided to make a preliminary examination of that region, which was done toward the end of August, 1906. Great Central Lake can now be reached with ease from the town of Alberni, a distance of 12 miles, by wagon road, the elevation of the lake being 200 ft. above the sea. This inland sheet of water presents the same physical features as do the inlets which indent the west coast of Vancouver Island, the mountains rising abruptly from the water, with here and there a valley extending back for a considerable distance, the most important valley being that extending to Ash Lake on the northeast. The general length of the lake is east and west, and it is about 25 miles long by a mile or so wide. At its western end two creeks flow in, heading from mountains still farther to the west. A trail from the lake follows the more northerly of these creeks on a gradual ascent for a distance of ten miles until it ends in a basin, shut in by high mountains, the basin having here an elevation of 1,500 ft. above the Great Central Lake and 1,700 ft. above the sea. To the south a precipitous bluff rises 2,075 ft. high, from which pours a considerable stream of water that barely touches the rocks until it reaches the bottom, breaking into a mass of spray in its descent. The ascent of the bluff requires stout muscles and the aid of the small bushes which cling so tenaciously to the clefts in the rock. On the top there is a small rocky plateau or basin enclosing a lake about half a mile long by a quarter wide, the elevation of the lake being 3,350 ft. above the sea. This mountain lake, situated in the heart of Vancouver Island, with snow-clad mountains rising 2,000 ft. above it, and the blue crevassed glacier of the 'Nine Peaks' showing up to the south in the morning sun, forms a beautiful scene."

After having given some particulars of the Big Interior group of seven mineral claims, Mr. Carmichael summarized as follows: "The mineralized zone, showing in the face of the cliff to the north of the basin and forming the great mass of low-grade mineral on the property, is so large, so inaccessible, and the mineralization so scattered, that it would be impossible to obtain anything approximating an average general sample of the exposure without the expenditure of time and money not justifiable under the circumstances. However, at the foot of the cliff, there is a talus extending the whole length or width of the mineralized zone, made up of material broken away from the whole face of the zone in question. While this talus may to a certain extent have been affected by weathering, it still may be considered a very approximate sample of the inaccessible cliff. Samples were taken from this talus, from which it is judged that approximately the central portion of the mineralized zone will assay from 0.5 to 1 per cent. copper, with from 1.5 to 2 ozs. of silver per ton, and a trace of gold. This value extends over a width of about 1,500 ft., while to the right the mineralization gradually fades off into the country rock. To the left of the mineralized zone is what has been called, for purposes of designation, the 'brecciated zone,' and which is merely a continuation, to the left, of the mineralized zone which has here been subjected to a crushing due to movement, and in which the interstices between the fragments of the rock have been filled with secondary minerals, chiefly calcite, with some carbonate of copper forming a secondary enrichment. This secondary enrichment has taken place, as would be expected, along defined channels, producing streaks of higher-grade mineralization often forming commercial ore. Here, again, no general sampling was possible, although a tunnel has been driven for some 31 ft. into the bluff it was found impossible to examine the face of the cliff for ten feet on either side of the tunnel mouth. The mineralization just described, and which forms the great bulk of visible mineralization on the property, is admittedly very much diffused through the rock, and is, consequently, so low-grade as to be of value only if found to be amenable to some form of concentration, and of which there seems to be a fair probability."

## ASBESTOS MINING IN QUEBEC

By Reginald E. Hore.



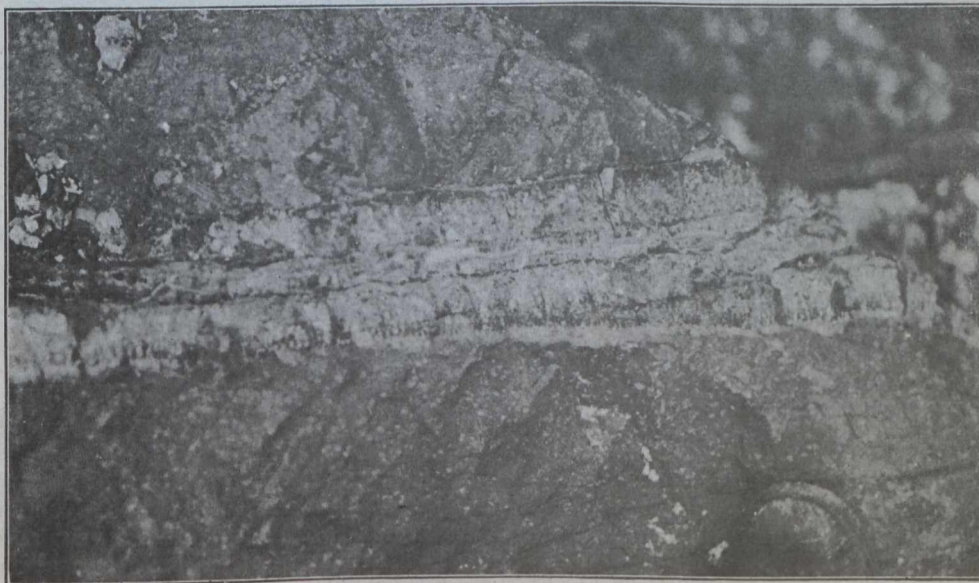
Asbestos veins in peridotite, Black Lake, P.Q.

Quebec is the world's chief source of asbestos. This material, being the best fireproofing material known, is in constantly increasing demand, and the industry has in recent years become a very important one. During 1912 the asbestos mining companies in Quebec employed 2,910 workmen, paid wages amounting to \$1,377,444, and produced asbestos valued at \$3,059,084.

The production from other countries is comparatively small. Russia is the chief producer outside of Canada. Most of the Russian asbestos is used locally or exported to Germany. A little reaches the United States and

enters into competition with the Canadian product. The United States is the chief manufacturer of asbestos products and depends on Canada for the raw material. The Canadian exports of asbestos during the year 1912 were reported by the Dominion Customs Department as 88,008 short tons valued at \$2,349,353. Of this quantity 71,426 tons was shipped to the United States, the remainder going chiefly to England, Germany and France.

The following table from a report by Mr. J. S. Diller, of the U.S.G.S. shows Canada's pre-eminent position as producer of asbestos:



Asbestos vein in peridotite, Black Lake, P.Q.

The asbestos is the thin central portion only. It is enclosed by serpentine.

## World's Production of Asbestos, 1900-1911, (in short tons):

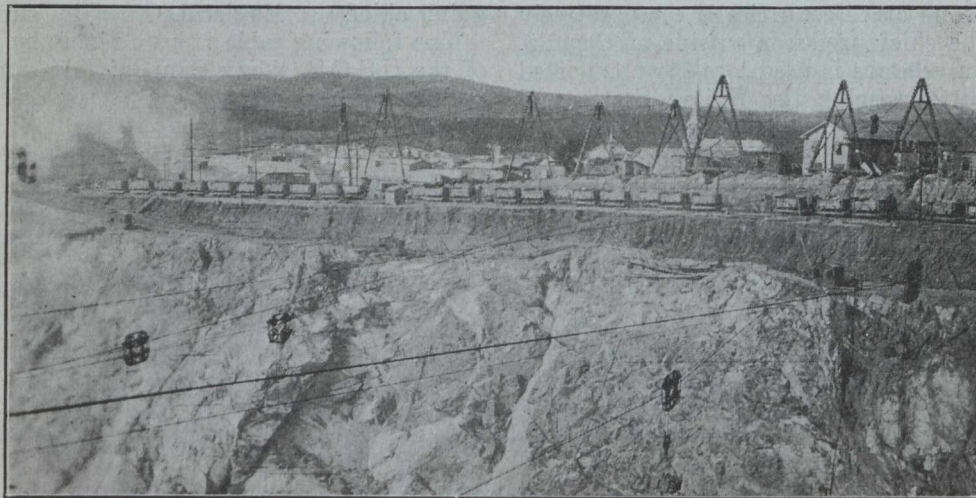
Country.	1900.*	1901.*	1902.*	1903.*	1904.*	1905.*
United States .....	1,054	747	1,005	887	1,480	3,109
Africa—						
Cape Colony .....	174	99	45	305	411	501
Natal .....	.....	.....	.....	.....	.....	1
Rhodesia .....	.....	.....	.....	.....	.....	.....
Transvaal .....	.....	.....	.....	.....	.....	.....
Australia .....	101	52	.....	.....	.....	.....
Canada—						
Asbestos .....	21,621	32,892	30,219	31,129	35,635	50,669
Asbestic .....	7,520	7,325	10,197	10,548	13,011	17,594
Cyprus .....	.....	.....	.....	.....	.....	.....
India .....	.....	.....	.....	.....	.....	.....
Russia .....	4,238	4,927	4,968	5,803	8,269	8,009
Country.	1906.*	1907.*	1908.*	1909.*	1910.*	1911.
United States .....	1,695	653	936	3,085	3,693	7,604
Africa—						
Cape Colony .....	522	604	1,267	1,674	1,403	†
Natal .....	.....	.....	.....	.....	3	†
Rhodesia .....	.....	.....	55	272	332	†
Transvaal .....	.....	.....	.....	.....	77	†
Australia .....	.....	.....	45	3	.....	†
Canada—						
Asbestos .....	60,761	62,130	66,548	63,349	77,508	100,893‡
Asbestic .....	21,425	28,296	24,225	23,951	24,707	26,021‡
Cyprus .....	21	99	521	172	487	†
India .....	.....	.....	.....	.....	3	†
Russia .....	10,142	11,497	13,129	14,654¶	12,193¶	17,071¶

\*Statistics taken from mines and quarries: General Report with Statistics, pt. 4, London.

†Statistics not available.

‡Report on the mineral production of Canada, calendar year 1911, Ottawa.

¶Min. Jour., London, Mar. 9, 1912, p. 228.



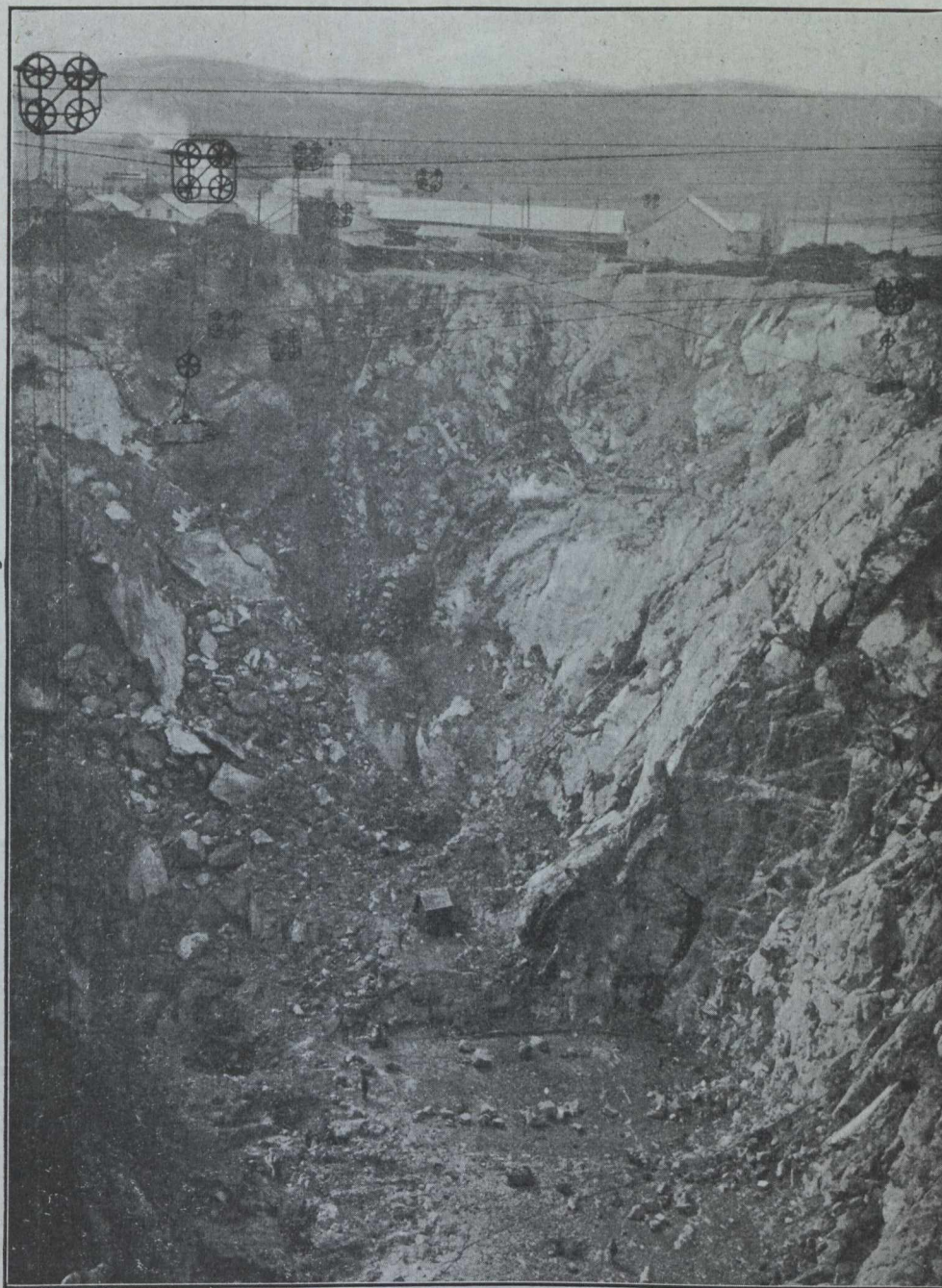
Asbestos mining at Thetford, P.Q.

Showing method of raising asbestos from open pits. Mill at left under characteristic dust cloud.

Canada's asbestos mines are located in the Eastern Townships, Province of Quebec. The chief producers are at Thetford, Black Lake, Danville, and East Broughton.

The asbestos occurs in thin irregular veins traversing masses of serpentine rock. The veins are seldom more than two or three inches thick, though occasionally they are five or six inches thick for short distances. The

asbestos is of a variety known as chrysotile. It is finely fibrous and has a silk-like lustre. The fibres are arranged transverse to the walls of the vein and are hence very short. Frequently the fibres extend from wall to wall and hence have a length equal to the thickness of the vein—a few inches. Commonly, however, there is a parting in the thin vein and then the fibres are even shorter—extending from the parting to either wall.



Asbestos Mining at Thetford, P.Q.

#### Method of Mining Asbestos.

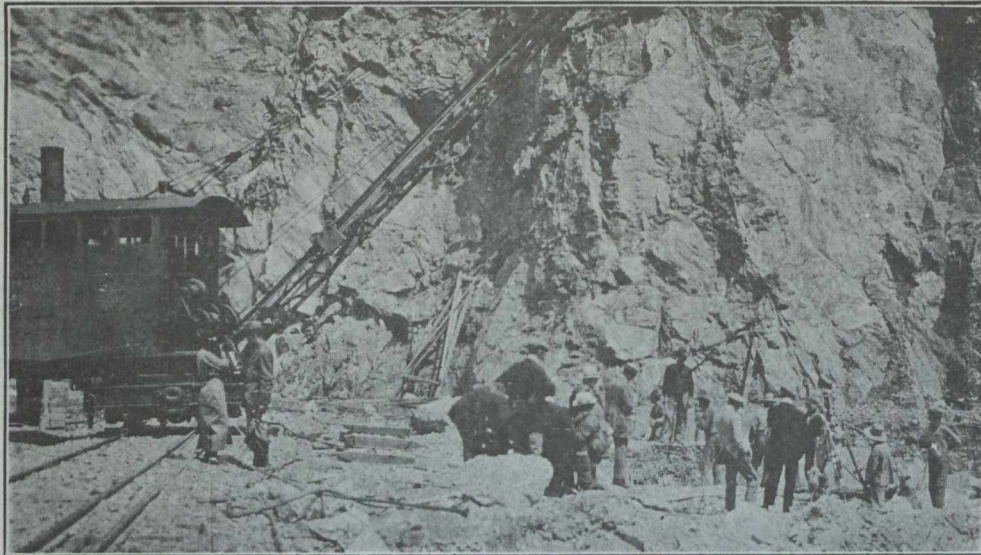
As the thin veins traverse the rocks in all directions and do not continue for great distances it has not been found possible to mine the veins individually. The practice is to break the rock containing veins and then sort out the asbestos from the waste rock. Usually the veins are not confined to a narrow zone; but extend in all directions through masses of serpentine. Hence the openings made in mining are very large and it has been found advisable to do most of the mining, or quarrying, as open cuts. At one property some underground work has been done; but most of the production is from open cuts such as those illustrated in the accompanying photographs. It will, therefore, be evident that the production varies with the weather. In winter, comparatively little work is done.

Lying on the asbestos bearing rock there is a deposit of soil varying in thickness. At Thetford it is about 15 ft. thick. It is removed either by steam shovels or by hand shovels, loaded into ears and drawn away.

When the overburden has been removed the rock is broken down in a series of benches by the use of dynamite. Machine drills are used in most of the mines, but hand drilling is the practice at some of the smaller properties.

The broken rock is sorted and the best quality of asbestos, known as long fibre, is picked out by hand. Rock containing short fibre and all the fine material is sent to the mill. The remaining rock is piled on the waste dumps.

To hoist the ore from the pits cable derricks are used. A rope is stretched across the pit and a carrier is sus-



**Bell Asbestos Mine, Thetford, P.Q.**

Geological Congress visitors viewing method of drilling and handling the ore.

pendent from the rope along which it travels by a system of pulleys as may be seen in the accompanying photograph.

#### **Hand-Cobbing.**

At the mills the higher grade mine product is broken up by hand. Heavy hammers are used to break the rock. The fibre thus separated from the rock is cleaned by girls using smaller hammers. The product from hand-cobbing is the asbestos known as 'crude' and is ready for the market.

#### **Mill Treatment.**

The discards from the cobbing sheds and the rock sent directly from the mine to the mill are treated mechanically. The material is first dried by exposure to the air, by steam pipes or in rotary dryers. The rock is then first crushed in jaw or gyratory rock-breakers, and then by rolls or in machines known as fiberizers and cyclones.

The material from these machines falls on a screen and the fibre is picked up by the suction produced by a fan. The fibre is then classified by treatment on grading screens into long and short fibre.

#### **DUTY ON LEAD AND ZINC**

A press despatch from Washington, D.C., states that in connection with the United States Tariff Bill, representatives of the Senate and House in conference have agreed to an adjustment of differences in regard to duties on lead and zinc, as follows: House representatives receded from their position requiring a rate of one and a half cents a pound duty on lead and accepted the Senate's rate of three-fourths of one cent a pound. Senate representatives yielded to the decision of the House that the rate on zinc ore be ten per cent. instead of twelve and a one-half per cent., as asked by the Senate.



**Asbestos bearing rock, Black Lake, P.Q.**



# DEVELOPMENT OF THE ASBESTOS MINING INDUSTRY IN QUEBEC\*

By Fritz Cirkel.

The use of asbestos can be traced back to ancient times. The Romans drew their supplies from the Italian Alps, and even from the Ural. They imagined it to be of vegetable origin; the highly silky appearance and unctuous feel giving them the impression that it was an organic substance.

It is said that cremation cloth, in which dead bodies were enwrapped to be consumed by fire, was made of asbestos. It appears, however, that the high cost of making this asbestos cloth militated against its general use. Pliny refers to it as a rare and costly cloth—"linum vivum—the funeral dress of kings" he calls it; evidently assuming that it was of vegetable origin. The fibre used came from the Italian Alps and was called "amianthus." It was apparently very difficult to spin, on account of its shortness; but judging from a piece of asbestos cloth on exhibition in the Vatican, and which is said to have originated in the days of ancient Rome, it is certain that vegetable fibre was intermixed with the real asbestos fibre in the making of so-called asbestos cloths. There is, moreover, according to Sir E. J. Smith, in the library of the Vatican, a winding sheet of Italian asbestos, which, although very coarsely made, is of a very soft and silky texture. This piece of cloth—perfectly preserved—was, together with some ashes, found in a sarcophagus in the Via Praenestina in 1702. It was subsequently placed in the Vatican Library by order of Clement XI. It appears that some vegetable fibre was used with real asbestos fibre in the making of the cloth; because it is reported that, when fire was applied at one end of the cloth, it burned with brightness, but leaving the real mineral fibre intact.

When Marco Polo was travelling in the thirteenth century through Siberia—at that time known as the Great Empire of Tartary—he was shown some cloth that withstood the action of fire. Marco found that it was made of a fibrous mineral called "amianthus," which resembled the Italian asbestos. Upon further investigation he found that the ore from which this fibre was extracted was first dried and then pounded in a mortar. After the impurities had been eliminated, the pure silky fibre left was used in a spinning process, the *modus operandi* of which is unknown. The fibre referred to in Marco Polo's travels, was long, beautifully white and silky; and probably belonged to the variety known to-day as "hornblende asbestos." This same variety is found in Corsica. Before its real value became known, it was used as a packing tow, and Dana reports that Dolomiea when packing up minerals for his collection on that island, used it in tying the boxes.

That asbestos was used in ancient times as lamp wicks is recorded by Plutarch, who called them "perpetual"; for the reason that the wicks never seemed to wear out. These lamps were principally used by the Vestal Virgins. The wicks, made of delicate asbestos fibre, formed small tubes through which the oil passed, while the wick itself remained intact. Pausanian mentions a lamp that was filled with oil only once a year; he evidently attributes to the oil what should have been credited to the wick—which was not consumed at all. He notes that the wick was made of "Carpasian" linen, referring to a mineral fibre obtained from Carpasius in Cyprus. It is said that Kirchner, the German philosopher, used in his library a lamp which had a wick made of "amian-

thus." Whatever the uses of asbestos may have been in days of old, it is certain that its peculiar non-combustible and spinning qualities were recognized and taken advantage of from the first; but it remained for modern times to make the mineral of commercial utility and an important factor in the industrial market of the world.

Although the discovery of this mineral is attributed to the Romans, who, as already related, mined it in a small way in the Alps, the knowledge of its existence—which may not have been more than local—apparently lapsed. Only in a few instances is it mentioned, or its utilization referred to in the literature of the middle ages. It appears that in the year 1720, asbestos was discovered in the Ural Mountains; and forty years later—under the reign of Peter I.—a factory for the manufacture of asbestos articles was established near the Naviansky works. But the known uses were so few, and the demand so limited, that the industry subsequently disappeared; and it was not until some forty years ago that technical interest in the mineral was revived in Europe. In the domain of applied mechanics its non-combustible properties were no sooner realized, than investigation of its nature and utility was begun in earnest—with a view to its application on a commercial scale. Since 1860, the search for asbestos has been incessant; the exploitation and development of the deposits discovered remarkable; and the progress made in the invention of mechanical methods of refining and preparing the mineral for utilization in the industrial world simply marvellous.

The first modern attempt to exploit asbestos deposits was made in the Aosta valley of the Italian Alps by a London syndicate, for the purpose of experimenting on a large scale; and almost simultaneously with the exploitation in Italy asbestos was discovered in the Des Plantes River region, between St. Joseph and St. Francis villages, Province of Quebec. At the exhibition in London, in 1862, a specimen of fine, silky-fibred asbestos from the above locality was exhibited.

The extension of the belt of serpentine rocks in which the mineral was known to occur had been traced with some care from the Vermont boundary in the township of Potton, to and beyond the Chaudiere River; but the deposits of asbestos discovered were comparatively limited. All attempts to work them profitably failed, and during the next fifteen years nothing was done in the way of exploration or exploitation.

In 1877, however, asbestos was found in another district in Quebec; this time in the serpentine hills of Thetford and Coleraine. The credit of this discovery is claimed by Mr. Robert Ward; although by others it is stated that the first find was made by a French-Canadian named Fecteau. Following closely upon this discovery several parties secured areas both at Thetford and Black Lake in Coleraine Township; close to the line of the Quebec Central Railway, which, for some miles, runs through a belt of serpentine. Large fires having swept over the country, destroying all forests, the discovery of veins was facilitated by the weathering of the mineral on the surface.

Mining operations on a small scale commenced in 1878, and in this year fifty tons were produced; but it was difficult to find a market. The quality of the fibre mined was excellent, and the width of the veins every-

\*Extract from monograph published by Department of Mines, Canada

thing that could be desired, being from  $\frac{1}{2}$  inch up to 2 inches, 3 inches, and sometimes 4 inches. This justified the expectation that large deposits of the mineral might exist in that locality, though their true importance and value were not ascertained for several years later. Shipments of the better grades to London created quite a sensation in the British market; hence extensive tests and investigations were made, with the result that, on account of its exceptional spinning qualities, high prices were soon established, and the race for the acquisition of additional areas likely to contain the valuable mineral began. The land upon which the asbestos was found was considered of very little practical value, either for agricultural or any other purposes, and mining operations were rapidly extended. The principal areas in which the asbestos-bearing serpentine was found to occur were lots 26, 27 and 28, near the line between ranges V. and VI. of Thetford, and in the township of Coleraine near Black Lake station, four miles southwest of Thetford station, in an area previously unsurveyed; but adjoining, on the south-west, range B, also on lots 27 and 28, range B; and on lot 32, range C. All these areas were speedily secured, as well as most of the serpentine-bearing ground extending south-eastward from the Quebec Central Railway towards Caribou Lake and for several miles along the Poudrier road.

During the next twelve years a rapid development of the asbestos industry was witnessed. The mines were operated on a large scale; while prospectors were busy exploring the hills of the surrounding country for new deposits of the mineral. Villages sprang up in the vicinity of the mines as if by magic, although the country—physically speaking—was sterile and very rough. Prior to the beginning of mining operations, the population consisted of only a few scattered families, but now increased to several thousands, and the whole country showed all the marks of industrial activity and prosperity.

In 1885, it was reported that seven quarries were in operation, which produced during the same season an aggregate of about 1,400 tons of asbestos. The prices obtained for the different grades were: First quality, \$80 per ton at the mines; second quality, \$60; third quality, \$40, and the lower grade—suitable only for pulp—\$10. The total number of men employed by the various operating companies was 350; distributed as follows: King Bros., 40; Boston Asbestos Packing Company, 100; the Johnson Company, 100; Ward Bros., 20; Lionais and Company, 40, and Irwin & Hopper, 50.

Dating from 1885, a gradual increase in the prices took place; especially for the first and second qualities. In 1900, about \$300 was realized for the first quality. This and other economic features in connection with the industry, served to give a powerful impetus to the development of the existing asbestos resources; additional mines were opened; the demand for the mineral continued brisk for a time; and properties were sold at a high figure. At a meeting of the Bell Asbestos Co., Ltd., held January 30, 1889, at the Cannon Street Hotel, London, England, the chairman, Mr. John Bell, announced a dividend of  $22\frac{1}{2}$  per cent. on the capital stock of the company for the year 1888, and said that the large growth of the asbestos business in general promised even better prospects for the current year.

But this state of affairs did not continue long; prices began to drop gradually, the demand slackened, and it was discovered that the prevailing methods of hand extraction were faulty, inadequate and expensive, especially with regard to the lower grades. As a matter

of fact, under prevailing price conditions, only those quarries which were working on rich ground, and had a large percentage of crude asbestos, had a chance to live, and carry on operations with a profit. The natural outcome of these adverse conditions was obvious; many quarries producing only a very small percentage of the higher grades were forced to shut down; and this, together with serious difficulties accentuated by overproduction and a consequent fall in prices, caused the industry to receive a severe set back in the middle of the nineties. For some years the industry languished, and this had a depressing effect on all except those who would not be discouraged, or who were naturally optimistic.

Those engaged in the quarries and those having the development of the industry at heart perceived that only one thing could save the industry, namely, a more economic production; hence they began to exercise their inventive powers; the result being that mechanical treatment of the lower grades of asbestos gradually displaced hand-cobbing; and this method, in the course of years, was applied with such conspicuous success that, to-day, every quarry in the district is equipped with a complete milling and fiberizing plant. By means of this improved process, all the smaller fibre—which in the earlier years was left in the rock and thrown into the dump—was saved; and as new demands for this short material sprang up, the life of a quarry was prolonged, and its operations performed with greater ease and economy.

The quarrying and production of asbestos in the Eastern Townships of Quebec is, to-day, one of the most prosperous industries in the Dominion of Canada. Previous to the discovery of this mineral, the district was but sparsely populated—being in a like condition to the famous Cobalt region prior to the discovery of silver—but continued success in exploitation and development has attracted thither a large mining and trading class, hence the population has rapidly increased during the last ten years. This result was brought about by the excellent quality of the product of the quarries; the practically unlimited supply of the mineral; the untiring efforts which were made by the proprietors and managers to effect mechanical separation and last, but not least, by the opening out of the Quebec Central Railway, which runs through the region. Indeed, it is doubtful whether the Canadian asbestos industry would have attained its present prominence and prosperity had it not been for the transportation facilities afforded from the beginning by that railway. The author knows of no mining camp in Canada where transportation facilities are as convenient as in the asbestos region of Quebec. The productive asbestos area—as determined by the author—now extends over twenty-two miles. In all this stretch not one productive quarry is located farther than one mile from the railway track; and as the latter runs generally parallel to the asbestos range, and since there is still room along the belt for the opening up of more quarries, every new establishment will participate in these special transportation facilities. Unless foreign asbestos fields yet unknown, having equal ease of access, produce the same quality and quantity of the mineral as the serpentine region of Quebec, the Canadian asbestos industry will continue to be the chief source of the world's supply.

During the last twelve years, new fields have been discovered in various parts of the globe; but as a matter of fact, none of the deposits so far discovered produce asbestos which compares favourably with the Canadian article, either in quality or quantity.

# KERR LAKE MINING COMPANY ANNUAL REPORT

## Report of President.

In his report to the shareholders of the Kerr Lake Mining Company for the year ending August 31st 1913, President William G. Nickerson said, on September 16th:

This year we have produced 2,109,975 ozs. of silver, and have reduced the reserves by only 600,000 ozs., leaving still approximately 6,000,000 ozs. of actual ore in reserve. This gain in silver is due to some important additions to reserves and to the excess of production in milling and high-grade ore over estimate, and to a much more liberal estimate of value of milling ores, justified by the year's production of same.

The total cost per ounce of silver is slightly higher, owing to a much larger production of low-grade ores with proportionately higher treatment charges. We also have charged to cost many improvements at the mine.

I visited the mine on the 12th of September, and found that Kerr lake had been lowered approximately fifteen feet. The ultimate success of the draining of the lake seems assured, and its importance has been already demonstrated by the discovery of several small, but very rich veins, formerly under water and not hitherto discovered by our underground explorations.

and east central portions. That in the central part did not disclose any veins of value, the conglomerate formation being found shallow, and soon changing to the more unfavourable Keewatin formation. In the east central part, a crosscut driven north from Little No. 3 shaft cut several veins, which were generally small and irregular, but in some of which a fair amount of second-grade ore, with some mill rock in the walls, was found. The conglomerate here, too, is shallow, but should be found to deepen as the work is carried to the north. In this work Nos. 23, 24, 25 and 27 veins were discovered, and No. 4 vein, formerly opened by an isolated shaft, was further explored by drift. Of these veins, Nos. 23, 24 and 25 contained the only profitable ore. Nos. 4 and 22, the latter discovered last year, and No. 27 had only low values. In the three first mentioned veins assays from 50 to 2,000 ozs. were obtained, and a little production of high grade was made in development. Further work must be done upon these veins before it will be known of how much importance they are as reserves.

In No. 3 vein the main work consisted of sinking the winze below the sixth level. From this winze, two drifts, Nos. 7 and 8 levels, were driven. All of this work opened

## Ore Production for the Year Ending August 31st, 1913.

Grade of Ore.	Net Weight,	Silver Contents,	Average Silver
	Pounds.	Ounces.	Content per ton.
1st Class .....	768,988	1,287,035	3,347.00
2nd Class .....	323,030	72,783	450.60
Jig and Table Concentrates .....	383,020	183,682	959.10
Bullion from Metallies .....	.....	31,834	.....
Mill Ore .....	18,252.3 tons	534,641	29.29
		2,109,975	

August estimated in part.

Much to my regret Mr. Susmann resigned his duties as your Secretary and Treasurer, but your company still retains the privilege of his valuable advice.

Your company is most fortunate in securing the services of Mr. Westlake as Secretary and Treasurer.

I wish to congratulate Mr. Livermore, General Manager, on the efficiency which he has shown in managing your mine and his success thus far in draining the lake.

## Report of Manager.

The report of the Manager, Robert Livermore, is, in part, as follows:

**Production.**—The gross production from all ores, for the year ending August 31st, 1913, amounts to 2,109,975 ozs. of silver. This figure includes 34,289 ozs. of silver on hand, August 31st, 1913, according to inventory. Of the total, 1,575,334 ozs. were produced from shipping ore, and 534,641 ozs. from low-grade ore milled by the Dominion Reduction Co., Ltd., at Cobalt.

**Development.**—Most of the known veins having been well blocked out, development work was reduced from the amount maintained last year to between four and five hundred feet a month, a rate more in proportion to the other work of the mine. In all, 4,984 linear feet were done, including drifting, sinking and raising, as against 8,481 feet last year.

Exploratory work in the more unprospected parts of the property was conducted by long crosscuts in the central

only ore of too low grade to be called an addition to the reserves. Sinking on the vein was finally discontinued at a depth of 487 feet below the collar of the main shaft. At this depth the formation has changed from diabase to Keewatin, and the vein, although still fairly strong, is barren of value.

In No. 7 shaft, connection was made between the 225 ft. level and the main shaft. The Fleming vein was also connected by crosscut to this shaft at the same level. By means of this work pumping and hoisting through separate winzes has been abandoned, and all water and rock is handled through the main shaft.

New developments above the 225 ft. level were not of great importance, although two new veins were found on the 140 ft. level, called Nos. 26 and 20A. Both of these veins are narrow, and contain only second-grade ore. Development and stoping on No. 7 vein proved the ore to exist a greater distance south of the shaft than was supposed, and several very rich shoots were taken out above the 90 ft. level. On the 140 ft. level, an extension to No. 8 vein was found which assayed over 2,000 ozs. over a width of 1½ inches for sixty feet.

The most important development of the year was upon the Fleming vein. As mentioned above, a crosscut was driven on the 225 ft. level, which opened the vein at this depth, and a drift was run on the vein nearly to the east boundary. This drift opened ore of much the same

grade and appearance as that had on the level above. The general run of ore may be said to be good second grade and mill rock, but there are occasional shoots of very high-grade ore. Beside the drift, a raise was driven to connect with the upper level, and a winze sunk to explore at fifty feet deeper, on the 275 ft. level. An interesting fact is that most of the ore shoot on the 225 ft. level is in Keewatin formation, while it was in conglomerate on the upper level. It has been found in most of the explorations in the district that the veins lose their value and strength with the change of formation from conglomerate to Keewatin, and this would seem to be an exception, but it is probably only one to the extent that it carries its value a little further into the Keewatin than usual, and at greater distance away from the contact the same conditions will apply as with other veins. Nevertheless, the developments to date have added a very fair amount of ore to the reserves in this vein, and as some good ore has been recently found on the 275 ft. level, also in Keewatin, it is reasonable to expect that the greatest depth of the ore shoot has not yet been reached. No stoping has been done on the Fleming vein.

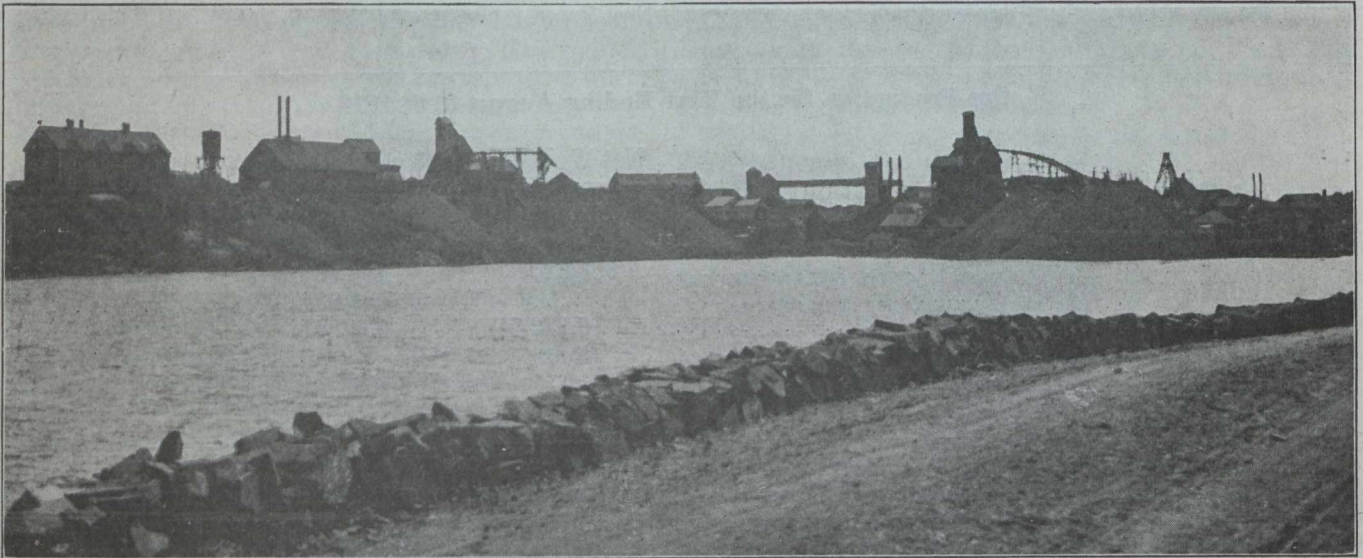
Developments for the coming year will continue the work in the still unprospected parts of the property, notably the conglomerate in the northeastern and central

block under the fourth level. None of the stopes on the vein above this level have been drawn upon during the year. The main east vein was stoped for a short distance above the 140 ft. level, but the greater part was left intact. The McDonald production was drawn mostly from broken reserves made last year, and little new stoping was done. In No. 3 vein, all known ore was removed, as it lay in small pillars which were rapidly becoming inaccessible from caving ground.

In consequence of the growing importance of ore of milling grade, it was found necessary to carry the stopes much wider than formerly to mine the ore of this class occurring as veinlets and leaf silver in the wall rock next to the high grade veins. Because of these wide stopes, which in places are twenty feet in width, in order to support the ground and mine the ore efficiently the square-set method of timbering has been adopted and carried through a large portion of the mine.

**Ore Sorting and Jigging Plant.**—No changes have been made here, the present plant being ample to treat the product for which it was designed. The total production for the year amounts to 383,020 lbs., assaying 959.1 ozs. per ton, a total of 183,682 ozs. of silver.

**Mill Ore.**—The production from this source was greatly increased, owing to the fact that a larger tonnage



Kerr Lake and Crown Reserve mines, Kerr lake, Ont.

sections, and at depth on the Fleming and No. 10 vein systems. A crosscut will be driven from the sixth level of No. 3 shaft to connect with No. 2 vein. This is a strong calcite vein in diabase from which some very good ore was taken near surface, but which has been little explored at depth. Other work will be in following up the veins soon to be opened for exploration by the draining of the lake, mentioned hereafter.

**Stoping.**—During the year stoping was distributed over most of the reserves, with the exception of the Fleming, where production was entirely from development. In general it may be said that the reserves produced more silver than was expected for the ground removed, and less of the available reserves were stoped than was anticipated.

The Big Chamber above the 140 ft. level was most largely drawn upon for the production, but still has a large amount of ore left in place. No. 7 vein furnished nearly as much silver mostly from the blocks south of the shaft, above the 90 ft. level. The best part of this vein is still in reserve. No. 10 vein produced well from the

of payable ore existed in conjunction with the high-grade veins than was at first thought, and that better facilities for handling the tonnage were made, both underground and by the addition of bin capacity above. A small hoist and incline were installed for handling dump material. Of the 18,252 tons sent to the mill, 3,389 tons were taken from No. 7 dump.

The 18,252.3 tons milled averaged 29.29 ounces per ton, a total of 534,640.87 ounces silver.

**Classes of Ore.**—There was hoisted 33,738 tons of ore, classed as follows:

	Tons.
<b>Sacking Ore—</b>	
1st Grade .....	379
2nd Grade .....	161
Jig Conc. ....	192
Total .....	732
Mill Ore .....	16,625
Waste from bumping tables .....	16,381
Total .....	33,738

**Costs—**

The following were the costs:

43,134 tons rock hoisted at a mining cost of \$5.07 per ton.

2,109,975 silver ounces at a mining cost of 10 38/100c. per oz.

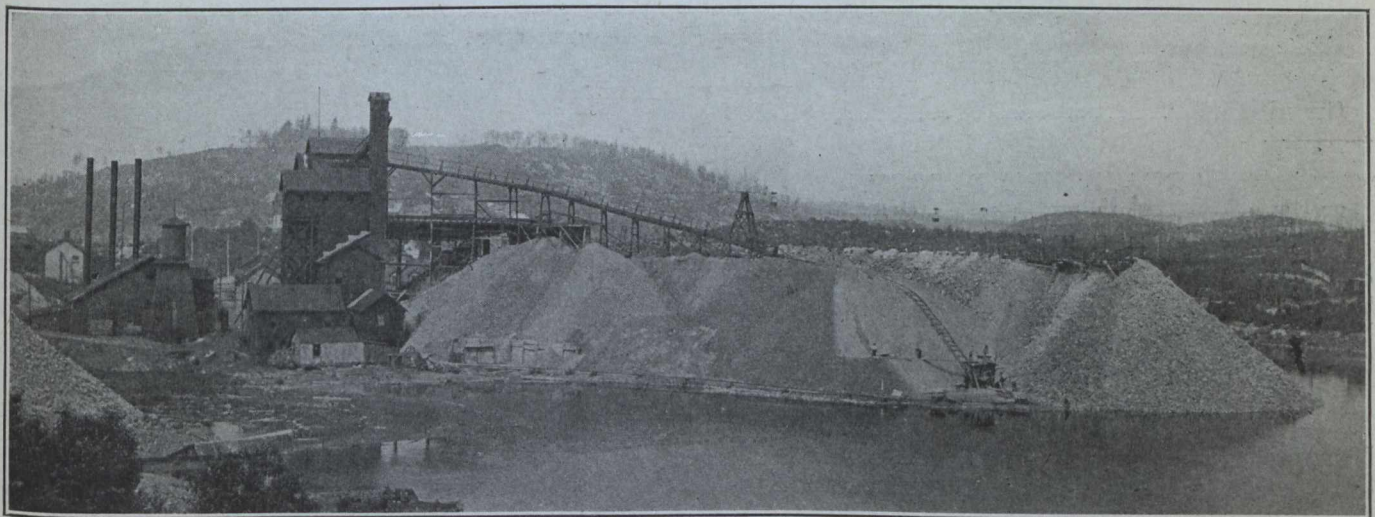
**Draining Kerr Lake.**—During the year all preparations were completed towards dewatering the lake, in order to develop and stope the ore-bodies lying beneath it. This work was undertaken jointly with the Crown Reserve Mining Company, Limited. Hitherto, the workings have been stopped at a safe distance away from the bottom of the lake, as established by careful soundings, and, consequently, many good veins have not been developed to their full extent.

Surveys were started as early as the summer of 1912, and the full plans were worked out during the following winter. The application to dewater having been granted by the Government in the spring of this year, machinery was ordered, and the work of construction finished in August. The pumps were started on August 28th, and at the present writing the lake has been lowered several feet. At the rate the work is proceeding, it is safe to say that the bulk of the water will be out of the lake before the cold weather.

ply on Kerr lake, a pumping plant has been installed on Giroux lake to supply them with water for all purposes. This plant consists of two motor-driven turbine pumps, each with a capacity of 500 gallons a minute, taking water from a well sunk in rock at the lake side, and connected to it by a blasted out passage. The water is pumped through an eight-inch pipe against 125 feet head to a 46,000-gallon receiving tank, whence it is piped to the different mines.

**Drummond Purchase.**—Lots J. B. 9 and 10, containing about six acres under Kerr lake, together with 33 feet of the shore, recently purchased from the Drummond mine, jointly by this company and the Crown Reserve Mining Co., adds to the territory to be explored when the lake is drained, and offers very fair prospects of finding new ore. Part of this ground is in conglomerate formation, and there is one vein showing native silver, on the present lake shore.

**Ore Reserves.**—Estimates of this year are largely based on production figures as before, except that the Fleming vein, whose greater width and regularity makes such method feasible, has been carefully sampled, and the total value calculated from widths and assays in the usual manner. In this case no distinction is made between high-grade ore and mill rock. This year, no



View of Crown Reserve mine from Kerr Lake mine

The plant in operation consists, briefly, of two pumping units of two centrifugal pumps each, the two units each driven by a 250 h.p. motor. The pumps and motors are mounted on a barge of some sixty tons capacity. The water is pumped against a head varying from 60 to 125 feet, through a twenty-inch pipe to Giroux lake, 2,700 feet distant. The rate of flow will average for the entire operation some 6,000 gallons a minute. The overflow from Giroux lake runs to the Montreal river. As the water in Kerr lake recedes, the barge is moved further out from the old shore line and new lengths of pipe connected.

It was originally calculated that between three and four hundred million gallons of liquid must be handled. As there are no inlets of importance in Kerr lake, it will be a simple matter, once the water is out, to keep it drained, and there will be no difficulty in recovering all of the ore hitherto considered unavailable, and of developing the undoubtedly valuable territory under the lake to its full extent.

As the Kerr Lake, Crown Reserve, and Cobalt Comet (Drummond) mines are dependent for their water sup-

separation is made between available and unavailable ore since the latter will soon be available by the draining of the lake.

All ore estimated may be called positive.

The situation regarding possible ore is a little improved over last year, as prospects are very favourable for finding extensions of vein systems thrown open to development under the lake. Also there are very good indications that some ore will be found in the Fleming vein at least as deep as our present deepest level, the 275 ft. No attempt, however, is made to estimate possible ore.

Ore reserves have been decreased, but not to the extent that was expected, owing to better results from stoping, a more liberal allowance for mill ore in reserve, due to better recognition of its value and quantity from data gained during the year, and additions to the reserves in the Fleming and No. 23 vein systems.

Production for the year showed that the estimates of September 1st, 1912, were conservative, as the actual silver produced from high-grade ore exceeded by over 300,000 ozs. the estimated silver content of the ground

removed. Of this excess, one-half has been allowed as an increase to the remaining reserves, and the other half used as a further factor of safety.

From lack of data, last year, mill ore reserves were given a very low value, which has been more than doubled from the year's production alone.

**Estimate of Ore Reserves, Kerr Lake Mine, Sept. 1st, 1913.**

Big Chamber Vein System.	Estimated
Big Chamber, Cross No. 11, Little McDonald.	ozs. silver.
McDonald Vein	567,700
No. 7 Vein	753,900
No. 8 Vein	885,400
Main East Vein	66,000
Xmas Vein	242,700
No. 10 Vein	49,900
No. 15 Vein	1,073,300
Little No. 7	140,200
Fleming Vein	16,800
Little No. 3	600,000
Nos. 2, 21, 18, 20a	7,000
Nos. 23, 24, 25	6,400
	25,000
<b>Total</b>	<b>4,434,300</b>
Gain over estimated reserve 31st Aug., 1912	150,000
Mill Ore	700,000
Dump Ore	735,000
<b>Grand Total</b>	<b>*6,019,300</b>

**TREASURER'S REPORT.**

The Treasurer, E. H. Westlake, says, in part:

The shipments for the year amounted to 2,160,878 ozs. The smelter settlements aggregate 1,977,870 ozs. The difference is accounted for by the deductions made by the smelting works for losses and in the way of treatment charges.

The costs of production per ounce are as follows:

	Cents.
Mining and development cost	10.38
Shipment and treatment charges	10.45
Administration and general	0.56
<b>Total</b>	<b>21.39</b>

The item "Mine Property" which at the beginning of the fiscal year stood at \$55,000, has been increased to \$130,000. The difference represents the purchase by the company of an undivided one-half interest in the 7-acre Drummond tract, which carried with it certain rights in connection with draining the lake.

All construction expenditures during the year have been charged to operating expense.

**Dividends Paid.**

The following is a statement of the dividends paid by the company to August 31st, 1913:

In 1906	\$90,000.00
1907	210,000.00
1908	360,000.00
1909	480,000.00
1910	990,000.00
1911	1,200,000.00
1912	690,000.00
1913	600,000.00
<b>Total</b>	<b>\$4,620,000.00</b>

**Expenditures for the Fiscal Year 1912-1913.**

Cost of production and development:	
Stopping	\$18,710.10
Development	29,036.81
Power, Light and Heat	27,569.25
Ore Sorting and Jigging	15,346.55
Tramming	28,963.53
Hoisting	8,060.02
Timbering	17,011.79
Pumping	760.33
Drills and Steel	9,316.17
Mine Expense	11,217.22
Repairs to Plant and Buildings	5,950.31
Stable Expenses	5,206.12
Office Expenses	4,165.06
Surface Maintenance	11,130.29
General Expenses	989.55
Taxes	24,780.00
Boarding House	779.93
	<b>\$218,993.03</b>
Shipment, treatment and other charges:	
Shipment Expense	\$1,349.24
Milling	2,643.49
Freight	9,323.65
Ore Treatment Expense	92,632.61
Assaying	4,891.22
Insurance	3,608.95
	<b>114,449.16</b>
Administration and general expenses	<b>11,736.23</b>
	<b>\$345,178.42</b>
Balance being profit carried to balance sheet	<b>837,315.44</b>
	<b>\$1,182,493.86</b>

**Receipts for the Fiscal Year, 1912-1913.**

Proceeds of ore sales	\$1,176,399.48
Less—	
Ore on hand, at Smelter and in Transit 31st August, 1912, at estimated value..	205,262.18
	<b>\$971,137.30</b>
Plus—	
Ore on hand at, Smelter and in Transit 31st August, 1913, at estimated value..	192,989.09
	<b>\$1,164,126.39</b>
Interest	<b>18,367.47</b>
	<b>\$1,182,493.86</b>

**NORTH AMERICAN SMELTING CO.**

A press despatch from Ottawa states that a case involving a charge of discrimination by the railways against eastern ore smelters in favour of those of British Columbia, was recently heard by the Dominion Railway Board. It is said to have arisen out of an application by the North American Smelting Co., of Kingston, Ont., for a reduction in the rates on lead and silver-lead ores from British Columbia to Ontario. It was stated on behalf of the Kingston works that the Canadian Pacific Railway, by charging a lower rate on refined lead and silver from the West, makes it impossible for owners of reduction works in the East to compete with the lead smelting and refining works at Trail, B.C. The Board will not give a decision in the matter until after owners of works in the West shall have had an opportunity to state their side of the case.

## COPPER MINING IN MICHIGAN

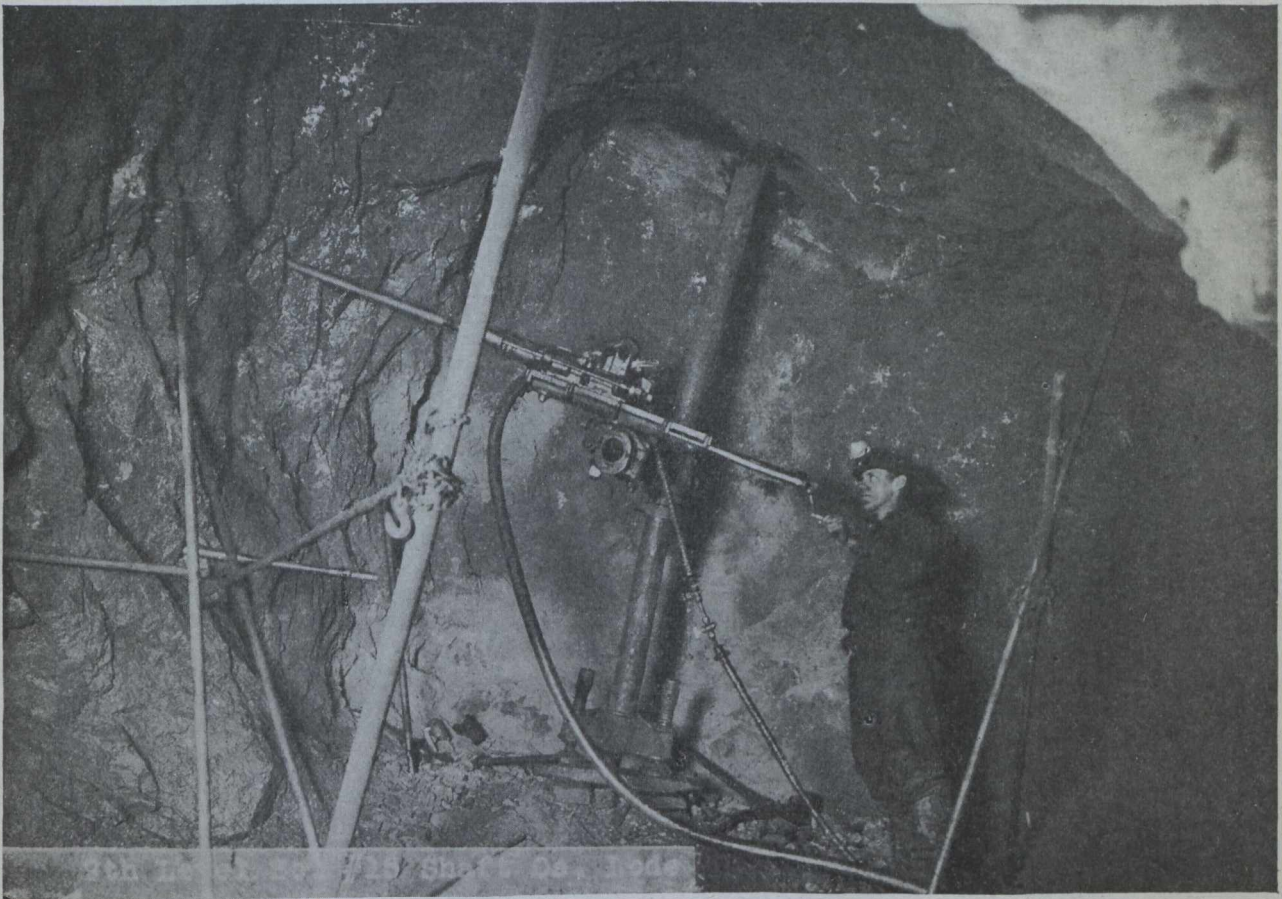
By Reginald E. Hore.

Michigan has long been known as an important producer of copper. The mines of the Lake Superior district are among the oldest regularly worked mines in America. One of them, the Tamarack, is the deepest in the world. Another, the Calumet and Hecla, is one of the largest in the world and has the distinction of having returned to shareholders over \$120,000,000 in dividends. The Quincy mine from much leaner ore has yielded profits of over \$20,000,000, and has a remarkable record for regularity in dividends.

Other well known Michigan copper mines which are or have been profitable, are the Ahmeek, Atlantic, Baltic, Central, Champion, Cliff, Copper Falls, Franklin, Kearsarge, Minesota, Mohawk, Osceola, Tri-

pends on very small fluctuations in the price of copper.

Besides the producing mines there are numerous properties on which exploratory or development work is being done. Few explorations prove profitable; but the prize being a large one, fortunes are spent in the endeavour to find another profitable deposit. It is noteworthy that of the forty properties on which work was being done in 1912, when the price of copper was unusually high, only 18 were in position to make large outputs, 13 operated during the year at a profit; but only nine were able to declare dividends. In the preceding four years copper averaged only 13.25 cents per pound, and only eight companies were able to declare dividends during that period.



Leyner drill. 9th level. Osceola amygdaloid lode  
Calumet and Hecla Mine, Calumet, Mich.

Photo by O. Gardner

mountain and Wolverine. Of these Atlantic, Central, Cliff, Copper Falls and Minesota have been worked out and abandoned. The old Franklin was nearly worked out, and then purchased by the Quincy Mining Company, which property it adjoined.

Taking the place of these idle mines and contributing largely to Michigan's production are the Allouez, Centennial, Superior, Franklin Junior, Isle Royale, Victoria, Mass and Lake mines. With the exception of the Superior and Lake these are all old mines, but have never paid dividends. The Allouez, Superior and Isle Royale are very likely to be the first to join the list of dividend payers. The costs at the others are comparatively high and their success or failure de-

The total dividends paid by these eight companies in 1911, when copper averaged 12.5 cents per pound, amounted to \$5,351,125, and thirteen other companies were forced to levy assessments amounting to \$2,086,299 in order to continue operations.

In 1912, when copper averaged 16.5 cents per pound, nine companies paid \$9,901,875, and the assessments levied totalled only \$986,000.

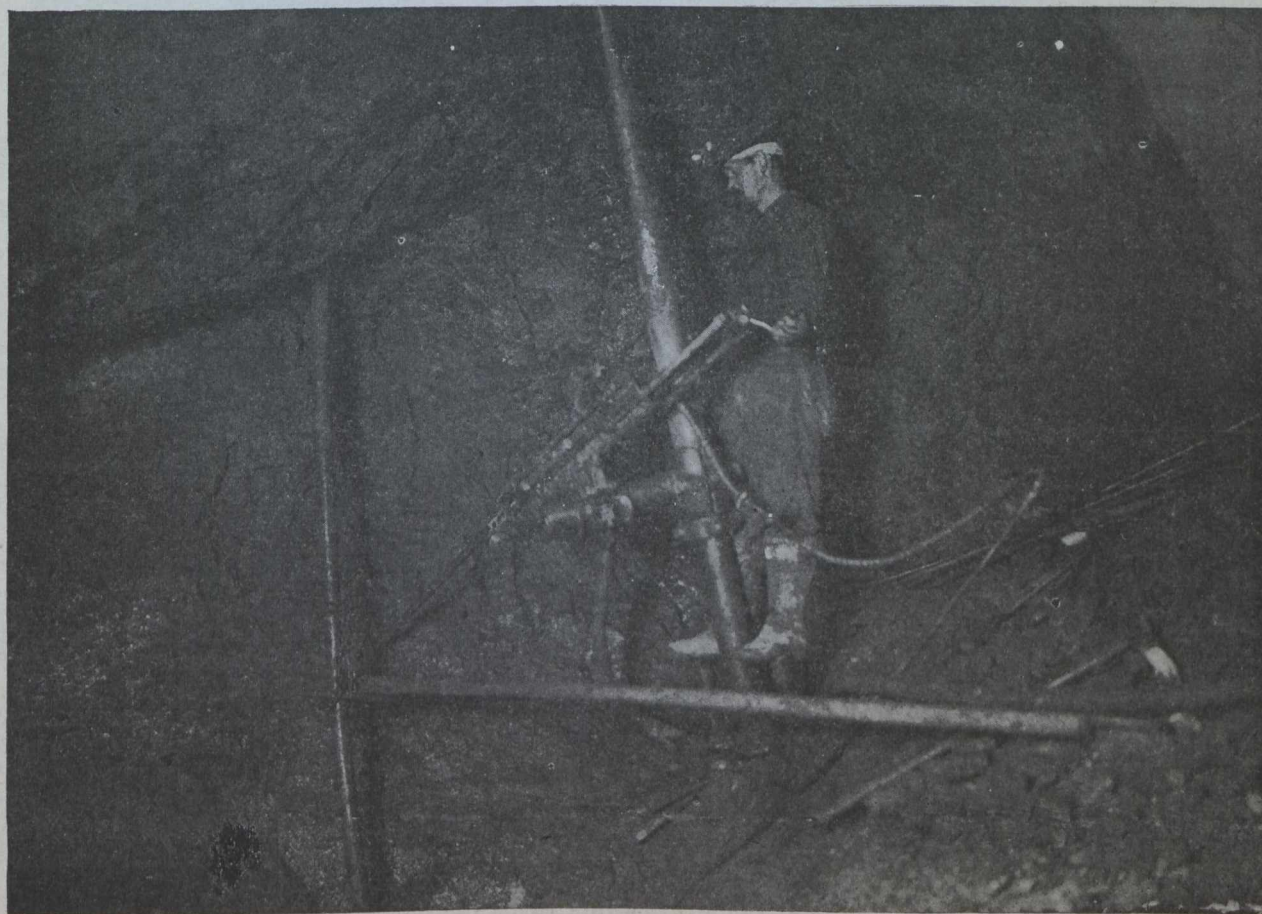
The record of the producing companies is shown by the following table which, with other data given below, accompanied reports on the copper industry made by the writer for the Michigan Geological Survey:

**SUMMARY OF RESULTS OBTAINED IN 1908, 1909, 1910 AND 1911 BY THE 18 COPPER MINES  
WHICH PRODUCED OVER 90 PER CENT OF THE TOTAL OUTPUT OF MICHIGAN.**

		Tons ore stamped.	Cost of mining, transportation, stamping and taxes, per ton.	Pounds refined copper produced.	Pounds refined copper per ton of ore stamped.	Cost per pound at mine excluding construction.	Cost per pound smelting, freight, commission, eastern office.	Total cost per pound, copper.	Price received for copper sold.
1. C. & H. All ore.....	1911	2,909,972	1.84	74,130,977	25.47	.....	.....	8.52	12.82
	1910	2,795,514	1.92	72,059,545	25.77	.....	.....	8.96	13.20
	1909	2,842,880	1.93	80,095,995	28.18	.....	.....	8.28	13.61
2. C. & H. Conglomerate.	1911	2,643,938	2.15	82,549,979	31.22	.....	.....	9.00	13.62
	1910	1,924,480	2.07	58,469,399	30.38	.....	.....	8.25	12.82
	1909	1,950,040	2.11	58,739,509	30.12	.....	.....	8.55	13.20
3. Tamarack.....	1908	1,999,880	2.11	66,285,684	33.14	.....	.....	7.77	13.61
	1911	1,958,200	2.25	70,427,877	35.96	.....	.....	8.38	13.62
	1910	392,338	2.69	7,494,077	19.1	14.07	1.23	15.56	12.71
4. C. & H. Amygdaloid..	1910	525,554	2.67	11,063,606	21.1	12.66	1.30	14.70	12.97
	1909	689,099	2.44	13,533,207	19.6	12.41	1.18	14.30	13.32
	1908	654,894	2.57	12,806,127	19.6	13.14	1.36	15.24	13.39
5. Osceola.....	1911	985,492	1.34	15,661,578	15.89	.....	.....	9.95	12.82
	1910	831,194	1.41	13,150,427	15.82	.....	.....	10.53	13.20
	1909	838,200	1.42	13,752,276	16.40	.....	.....	10.41	13.61
6. Ahmeek.....	1908	685,738	1.75	12,122,102	17.67	.....	.....	12.25	13.62
	1911	1,246,596	1.14	18,388,193	14.8	7.73	1.06	9.28	12.78
	1910	1,217,720	1.28	19,346,566	15.9	8.04	0.98	9.37	13.04
7. Allouez.....	1909	1,494,845	1.36	25,296,657	16.9	8.04	0.99	9.47	13.30
	1908	1,241,400	1.45	21,250,794	17.1	8.25	1.10	10.25	13.39
	1911	598,549	1.42	15,196,127	25.4	5.61	1.19	7.17	12.78
8. Wolverine.....	1910	530,365	1.42	11,844,954	22.3	6.37	1.16	11.05	12.99
	1909	406,045	1.72	9,198,110	22.7	7.61	1.10	15.48	13.37
	1908	298,178	1.78	6,280,241	21.1	8.64	1.11	12.66	13.46
9. Mohawk.....	1911	288,610	1.668	4,780,494	16.56	10.07	1.95	13.30	12.822
	1910	247,119	1.769	4,655,702	18.84	9.39	1.81	11.57	12.68
	1909	253,049	1.806	4,031,532	15.93	11.34	1.51	13.39	13.26
10. Centennial.....	1908	220,905	2.051	3,047,051	13.80	14.86	1.40	16.81	13.35
	1911	394,433	1.60	9,995,748	26.75	6.002	0.923	7.375	13.35
	1910	802,548	1.406	12,091,056	15.07	9.33	0.81	10.399	12.63
11. Baltic.....	1910	902,537	1.43	11,412,066	14.22	10.076	0.889	11.44	13.09
	1909	819,019	1.40	11,248,474	13.73	10.22	0.875	11.21	13.20
	1908	685,823	1.44	10,295,881	15.01	9.60	0.938	10.75	13.43
12. Champion.....	1911	86,543	1.869	1,493,834	17.26	10.83	1.43	12.69	12.842
	1910	101,133	1.9477	1,572,566	15.40	12.65	1.49	14.48	13.12
	1909	196,525	1.818	2,583,193	13.15	13.82	1.56	15.61	13.28
13. Trimmountain.....	1908	169,693	2.086	2,196,377	12.94	16.12	1.63	18.49	13.39
	1911	696,795	1.714	15,370,449	22.06	.....	.....	9.09	12.54
	1910	781,419	1.67	17,549,762	22.46	.....	.....	8.32	12.74
14. Tamarack.....	1909	814,260	1.55	17,817,836	21.88	.....	.....	7.98	13.00
	1908	764,117	1.56	17,724,854	23.20	.....	.....	7.72	13.39
	1911	734,392	1.743	15,639,426	21.296	.....	.....	9.63	12.54
15. Tamarack.....	1910	722,051	1.86	19,224,174	26.62	.....	.....	7.85	12.74
	1909	753,908	1.80	18,005,071	23.88	.....	.....	8.45	13.00
	1908	794,703	1.62	17,786,763	22.38	.....	.....	8.34	13.39
16. Tamarack.....	1911	347,885	1.819	6,120,417	17.59	.....	.....	11.55	12.54
	1910	317,299	2.00	5,694,868	17.95	.....	.....	12.17	12.74
	1909	323,408	2.09	5,282,404	16.33	.....	.....	13.89	13.00
17. Tamarack.....	1908	334,929	2.05	6,034,908	18.02	.....	.....	12.5	13.39



14. Superior. . . . .	1911	162,599	2.39	3,236,233	19.90	12.01	2.02	15.31	12.652
	1910	140,514	2.69	3,181,041	22.64	.....	.....	14.29	12.63
	1909	81,641	....	1,781,315	21.82	.....	.....	.....	13.56
	1908	962	....	21,244	22.08	.....	.....	.....	.....
15. Quincy. . . . .	1911	1,382,254	....	22,252,943	16.1	9.25	0.89	10.62	12.725
	1910	.....	....	22,517,014	.....	8.80	0.93	10.48	13.20
	1909	.....	....	22,511,984	.....	8.85	0.91	10.52	13.40
	1908	.....	....	20,600,361	.....	9.615	0.85	11.27	13.57
16. Franklin. . . . .	1911	.....	....	820,203	.....	.....	.....	.....	12.516
	1910	113,859	....	966,353	.....	.....	.....	.....	13.33
	1909	170,456	1.94	1,615,556	9.47	.....	.....	.....	.....
	1908	.....	....	.....	.....	.....	.....	.....	.....
17. Isle Royale . . . . .	1911	457,440	1.42	7,490,120	16.4	8.97	1.21	10.85	12.38
	1910	520,860	1.42	7,567,399	14.5	9.75	1.26	11.84	12.68
	1909	401,280	1.87	5,719,056	14.3	13.12	1.44	16.64	13.00
	1908	218,940	2.33	3,011,664	13.8	16.91	1.99	28.99	13.29
18. Victoria. . . . .	1911	126,894	....	1,303,331	10.3	.....	.....	.....	.....
	1910	122,497	....	1,164,564	.....	.....	.....	13.4	12.3
	1909	118,605	....	1,062,218	.....	.....	.....	.....	.....
	1908	109,015	1.51	1,290,040	11.18	12.366	1.97	14.335	13.10
19. Mass . . . . .	1911	73,475	....	1,326,898	17.58	.....	.....	.....	12.50
	1910	90,747	....	1,321,885	14.59	.....	.....	.....	.....
	1909	139,404	....	.....	12.36	.....	.....	.....	.....
	1908	171,268	....	.....	10.31	.....	.....	.....	.....
Total production (from U. S. G. S. Reports).	1911	10,978,827	....	219,840,201	20.0	.....	.....	.....	12.5
	1910	10,869,561	....	222,683,461	20.5	.....	.....	.....	13.00
	1909	11,429,394	....	234,136,529	20.5	.....	.....	.....	12.7
	1908	10,531,271	....	223,286,700	21.2	.....	.....	.....	13.2



A one-man (Leyner) machine  
5th level. Osceola amygdaloid lode. Calumet and Hecla mine.

Photo by O. Gardner

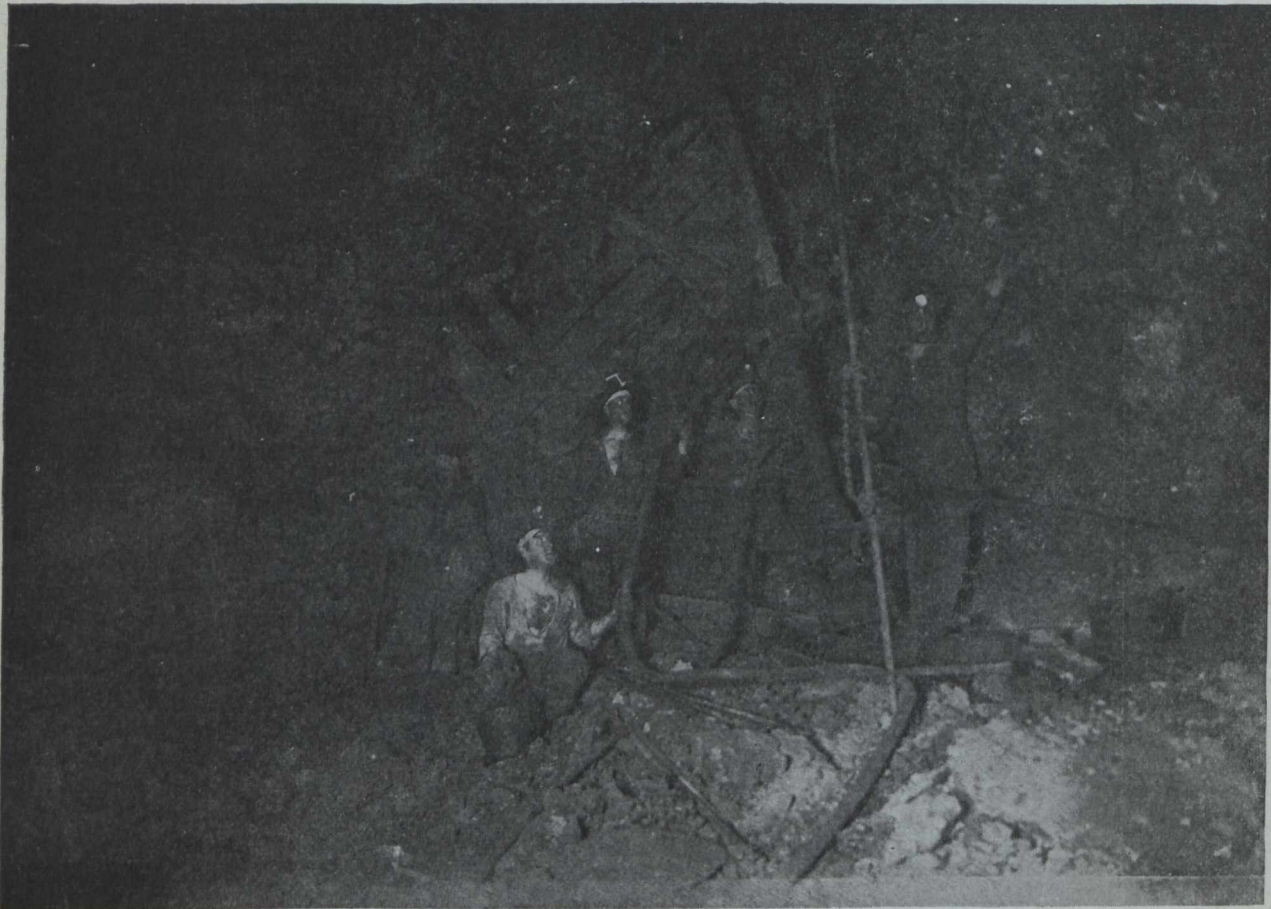
**Recent Progress.**—The year 1912 was an unusually profitable one for Michigan copper mining companies and the companies made larger profits while paying higher wages than in previous years. The dividend-paying companies made larger disbursements than in 1911 and increased their surplus of assets. Large amounts were spent for construction and development work at the producing mines and more vigorous examination made of several properties that are not yet productive. Two new companies and one reorganized company began diamond drilling investigations that are expected to be continued over large acreages.

An unfortunate circumstance, and one most keenly felt by companies whose property is not centrally located, has been the scarcity of suitable labour. In

of larger furnaces and more mechanical appliances to handle charge and furnace products has lowered the cost of smelting. In spite of the many improvements, the year 1912 showed higher costs per pound of copper produced. This, in most cases, at least, is due to higher wages paid, and means simply that the mine owners shared with the miners the profits of a successful year.

**Dividends.**—During 1912 the dividend-paying mining companies paid to shareholders \$9,901,875, and added considerable amounts to surplus account. Ahmeek, Baltic, Calumet & Hecla, Champion, Mohawk, Osceola, Quincy, Trimountain and Wolverine all paid larger dividends than in 1911. Dividends paid for the past five years and to date have been as follows:

(To be continued)



Two two-man (Rand) machines

Photo by O. Gardner

62nd level. Calumet conglomerate lode. Calumet and Hecla mine, Calumet, Mich.

spite of the increased wage offered, many of the companies, during the summer months especially, were unable to secure enough men to permit of very economical operation. This inability to run the mines at capacity prevented the owners from taking full advantage of good copper prices and increased the cost per ton produced. The increase in cost due to labour scarcity has been partially, but not wholly, offset by improvements in methods. Recently there has been more than ordinary attention paid to the improving of efficiency of all departments. New methods and machines and less waste of labour and supplies have materially decreased the cost of breaking and handling the ore underground. Labour saving devices have cut down the rock-house costs. New machinery installed at the mills gives a better recovery from the ore treated. Use

## PORTFOLIO OF MINES

On June 1 The Canadian Mining Journal expressed the opinion that a British Columbia mining association had acted unwisely in beclouding the issue of a separate Portfolio of Mines at Ottawa by submitting the name of the member for Kootenay in the House of Commons for appointment as such Minister. A correspondent draws attention to a change in the attitude of the Nelson Daily News, a publication that for a while gave prominence to Mr. R. F. Green's name in connection with the proposed separate portfolio. Some weeks ago the Daily News said editorially: "The Daily News wants to be distinctly taken as advocating no special man for the position (of Minister of Mines). It believes Premier Borden can be trusted to make a suitable selection if such an appointment is decided on."

# CANADA'S NICKEL INDUSTRY

By Alex. Gray

(Continued from October 1st issue.)

## THE MOND COMPANY.

So much for the genesis and evolution of the nickel fields and the predominant partner in the nickel industry. Analysis of the data submitted in relation to the industry as a whole and the International Company in particular, invites the conclusion that both have attained to maturity. The industry certainly had no adolescent youth. It was at once an "ugly duckling." It was long in acquiring aplomb and in becoming a source of pride to its proprietors. If it was the despair of its earliest sponsors, it is ripe for the admiration of those who have a permanent interest in Canada's special mineral resources. That it was cradled in adversity, almost disowned by those whose natural heritage it is, practically discarded by domestic capitalists as unworthy of their serious considerations, rather emphasizes what has been achieved, accentuated as that success was by the recent increased capitalization of the respective producing companies and of other concerns in process of formation.

An insular view obtained, now and again, that an export duty on nickel large enough to be prohibitive almost—would be an effective method of averting war—more so than Peace preachments. As well might the constituents contained in ordinary explosives be made contraband. By adding to the armour of the God of Battle, by substituting a larger measure of immunity during naval conflicts, by increasing efficiency in the steel and allied arts, nickel—the nickel of Ontario—became indispensable. Local prejudice, because those who solved the metallurgy of these complex ores and created a world-wide demand for the refined metal without confiding in everybody, bulks small alongside of the avidity with which latter-day promoters seek to benefit from the research of the pioneer companies.

Within a year or two the law of national self-preservation, and the serenity with which the International and Mond Companies have expanded, pursued broader markets while perfecting plans to more fully supply those markets, resulted in the proving and pre-emption of nickel-bearing areas to an extent establishing Ontario as the future source of a metal the nations must have and the household arts will not be without. Whether or not the dream of the millennium, when warfare will become a matter for diplomatic or judicial arbitrament, is to be a reality, nickel will be more and more a utility removed from corrosive influences, essentially superior of itself or in alloy. Enough competition is extant and pending to preserve the equities in behalf of consumers.

It was the appreciation of all this that induced the Mond Nickel Company—properly to be designated as the junior partner to date in the nickel industry, to branch out with a new and modern smelter at Coniston near Sudbury, to acquire more properties in the Sudbury District, and to enlarge its metallurgical works at Clydach in Wales. Like the Canadian Copper Company, before it was merged into the International Nickel Company, and as the latter's shareholders experienced, the Mond Company can measure its success by contrast with its initial years of adversity.

The Mond carbon monoxide process in practice, differs from that of the International Company. Dr. Carl Langer and Dr. Ludwig Mond devised it and worked it out to a profitable fruition. In 1899 they sought the

Sudbury fields and located there, at what was named the Victoria Mine. The year following the Mond Nickel Company was organized by Dr. Mond, the capital being £600,000. This company took over the Victoria Mine and smelter. In 1901 bessemer matte was produced, but delays ensued there and at the Clydach refining works. Several years elapsed before shareholders had a "look in." Of those years the writer of this review has this to say: "The first profit and loss statement was made up in 1903. Dr. Mond retained all of the deferred shares and many of the ordinary shares as part of the vendor consideration. Not only that, but for the first few years he met the dividend on the preferred shares; rather he made good all deficiencies. That his reward was worth waiting and working for, is evidenced by the fact that the deferred shares have drawn almost 200 per cent. in the five years ended April 30, 1910, the rate for each of the latter three years being 48 per cent. per annum. Yet Dr. Mond was no different from other scientists and capitalists who enlisted in the nickel business. 'It took longer'; as the Financial News of London remarked, 'to reach the dividend-paying stage than Dr. Mond had anticipated when the works were put up.'"

The Mond Company now is capitalized at £850,000, with £500,000 in 7 per cent. cumulative preference shares of £1 each; £300,000 in ordinary shares of £1, and £50,000 in deferred shares of £1 each. In the repayment of capital, the preferred shares, besides being entitled to the cumulative dividend of 7 per cent., have a priority of £7 10s. 0d. per share in the event of the distribution of assets. The ordinary shares have the right to a non-cumulative dividend of 7 per cent. per annum and one-half of the surplus profits, the deferred taking the other half.

After four years, in 1904-5, the ordinary shareholders received 6 per cent. In 1905-6 the ordinary shares paid 10 per cent. and the deferred shares 18. In 1906-7 the ordinary shares paid 12½ per cent. and the deferred shares 33. In 1907-8-9-10, the ordinary shares carried 15 per cent. and the deferred shares 48 per cent. In 1911 the ordinary rate was 16¼ per cent. and the deferred rate 55½ per cent. Otherwise arranged, the years 1909-11, inclusive, enabled the company to make this showing:

	1909.	1910.	1911.
Net profit .....	£111,320	£114,107	£140,803
Balance after dividends..	23,053	22,763	42,399
Brought in .....	29,923	32,976	20,741
For reserve, etc. ....	52,976	55,741	63,140
To reserve .....	20,000	35,000	35,000
Carried forward .....	32,976	20,741	28,140

Having those figures, it remains to quote the remarks of Sir Alfred Mond, Bart., M.P., chairman of the company, at the annual meeting a year ago, when he dealt with the 1911-12 doings, that is, for the year ended April 30, 1912. He said:

"I will deal with the balance-sheet first. If you look at the credit side there is an addition of £13,649 to the first item, namely, mines in Ontario (Canada), and freehold and leasehold land and houses in On-

tario and Clydach (South Wales). The bulk of this money has been spent on development in Canada and on some cottages at Clydach. In the next item, that is the smelting and refining works in Ontario and Clydach, the additions for the year amounted to £53,578. We are at present constructing new smelting works at Coniston, in Ontario, and this money has been spent on the construction of those works. The balance represents additions to our works at Clydach. The suspense account is always a fluctuating one, and has diminished by the sum of £5,000. Stocks on hand are some £14,000 up, while ore, raw material, and intermediate and finished products have increased by some £75,000. As our business increases we have to have larger amounts locked up in those items. Sundry debtors have increased by £19,000. The cash in hand shows an increase of £31,000, which is due to an instalment on the debenture stock paid in advance. As regards the debtor side of the balance-sheet, there is no alteration in the capital account. The first mortgage debenture stock, which we issued in the course of the last financial year, figures for the first time in our balance-sheet. The reserve fund, with the sum you voted last year, now stands at £185,000. The reserve suspense stands at £20,000, and your sundry creditors have increased by some £3,000.

"I will now deal with the profit and loss account. There was brought forward from last year £28,000, while the balance at credit for the financial year to April 30, 1912, is £154,364, which compares with £148,000, an increase of £6,000. The net outcome, in comparison with a year ago, is that the amount we have to deal with as profit is £13,200 more. I have very little to say about the balance-sheet. All the increases are in the ordinary course of our business, and the satisfactory item in it is the increase in the profit and loss account.

"Turning to the report of the directors, although the profits are somewhat higher the board have decided—and we have no doubt that the shareholders will agree—not to make an alteration in the amount of the distribution, but to leave the dividend at the same rate to which we raised it last year. Of the balance, we propose to place £15,000 to the ordinary reserve bringing the amount to £200,000, and to place £20,000 to the reserve suspense account, bringing its total amount to £40,000. We propose to carry forward the balance, namely, £41,381. This, I think, leaves our company, in a very sound position, and provides well for contingencies in the future. The progress of the operations of the company, both in Canada and in England, in spite of difficulties not due to internal causes, has been very satisfactory indeed.

"In consequence of the continuously-increasing demand for the metal we manufacture we have decided to enlarge our works in Wales. So far as our new smelting works, in Ontario are concerned, I am glad to be able to tell you, that, in spite of a winter of such exceptional severity that I believe nothing like it has been known in Canada for more than sixty years, the programme that was planned for the making of the railway tracks, laying of the concrete foundation, and of all the preliminary works, was carried out practically without a hitch. It was kept well up to time, and I think that the greatest credit is due to our Canadian staff, who succeeded in spite of temperatures which would alarm anyone in this country. The work is proceeding very well, and the

latest reports are that the steel work of the different buildings is going up, and that there is every prospect of the new plant—which will be a very fine and entirely up-to-date smelter—being completed in the time contemplated.

"Our accounts from the mines as to developments are extremely satisfactory, and I think our shareholders have every reason to be satisfied. We, of course, are dependent for our profits to some extent on the fluctuations of the copper market, as we are not only producers of nickel metal, but also large manufacturers of copper sulphate. I am glad to say that although prices last year were above the very low levels reached in previous years, they are steadily improving, and if the present prices of copper are maintained we ought to benefit considerably in the course of the current financial year."

In the calendar year 1912 the Mond Company did not handle so large a tonnage as in 1911. According to the Ontario Bureau of Mines, 163,352 tons were raised in the latter year; 116,932 from the Garson mine, and 46,370 from the Victoria mine, as against a total tonnage raised in 1912, of 117,568. This falling off may have been due to the concentration of work upon the completion of the new Coniston smelter, the acquisition of other properties, the development of the Garson mine, and the shortage of ore at the Victoria. At any rate, the Mond people have their greater smelter in operation at Coniston and are fortifying themselves in the matter of ore supplies, having purchased the Worthington mine from its Montreal owners, found more ore at the Victoria, advanced the development of the Cochrane-McVittie property where there is a portion of "the great Frood deposit," as Dr. Coleman describes it, and otherwise provided for emergencies by buying ore from the Alexo mine near Kelso. With ore supplies assured and increased smelting and refining capacities in Ontario and at Clydach, the Mond Company may also take a considerable tonnage from the Murray mine, owned by the Canadian Nickel Corporation.

Its chief source of supply at present, is the Garson mine, near which the new and complete smelter is situated. A shaft is being sunk on the Cochrane-McVittie fraction. It will be sunk to a depth of 800 feet or so in order to tap the ore intersected by the drill, which drilling was done to determine whether this particular ground had any of the mass of ore as notified by the International Company's Frood or No. 3 mine adjoining.

That is why Dr. Coleman, already quoted, expects soon—to see this section "sending ore to the smelters of the two producing companies, and adding greatly to the available supply of the region." Power for the Coniston plant is obtained from Wahnapiatae river. With the company's recent territorial acquisitions, including the Levack, Kirkwood and Blezard, the Mond will be removed from the shortage of ore with which it was confronted for a while.

#### *Canadian Nickel Corporation.*

The Mond Company having a stronger hold upon the source of supply and having insured the retention of its share of markets for its special products, rivalry to the chief producer is impending. Within the past few months the Canadian Nickel Corporation, Limited, was organized under the auspices of Dr. F. S. Pearson, of New York, and London, counselled by consulting engineers, J. E. McAllister and Benjamin B. Lawrence, the capital being:

	Authorized.	Issued.
6% Debenture Stock .....	\$10,000,00	\$10,000,00
Common Stock .....	20,000,000	20,000,000

In this allocation of capital provision is made for the redemption of the debenture stock at or under 106 by means of an annual sinking fund, payable out of earnings, which, it is expected, will enable the entire issue to be redeemed in twelve years, a further safeguard being set out that "the interest and sinking fund payments must be made before any dividends are declared on the common stock."

Prior to the formation of the Canadian Nickel Corporation, nearly all of the areas held by it were acquired by those interested in the Dominion Nickel Copper Company, chiefly Messrs. J. R. Booth and M. J. O'Brien, along with Messrs. Fadyen and Chapin; their managers at different periods being Mr. J. N. Glidden and Mr. J. A. Holmes, the latter being largely instrumental in arranging the deal with Dr. Pearson and his colleagues, with the sanction and co-operation of Mr. Booth.

It is the understanding that Mr. O'Brien would rather have dealt with Kirby Thomas, M.E., in behalf of the Messrs. Guggenheim, but Mr. Booth, in concert with Sir William Mackenzie, closed with Mr. McAllister, who represented the Pearson interests. As a consequence the Messrs. Guggenheim after having bid for it, declined to take the Worthington mine, which went to the Mond Company. Following is the initial memorandum prepared by the promoters of the Canadian Nickel Corporation. Its contents have not been made public until now when the financing plans are subjected to delay on account of monetary stringency in the world's banking centres:

**"PROPERTIES.**

"These cover approximately 17,500 acres in the Sudbury region—the most important source of the world's nickel supply—and include the following:

- Murray, Elsie and Lady Violet Group,
- Gertrude Group,
- Whistle and Wild Cat Group,
- Victor and Blue Lake Group,
- Falconbridge Group,
- Nickel Lake Group.

"From present development and prospecting work to May 1st, 1913, 6,800,000 tons of ore have been blocked out, or sufficient to operate on the basis of 1,500 tons of ore daily for almost thirteen years, while the engineers estimate that the properties contain at least a further equal amount.

**"POWER AND TRANSPORTATION.**

"Hydro-electric power is obtainable at from \$12 to \$16 per horse power per annum from two companies generating power in the district. The Canadian Nickel Corporation, however, proposes to generate its own hydraulic power and to install two units of 5,000 kilowatts each, thereby reducing the cost below the above figures.

"Excellent transportation and shipping facilities are available as three railway lines serve the property, namely, Canadian Northern, Canadian Pacific, and Algoma Eastern Railway.

**"REFINING.**

"The rights to a refining process (which has been in successful operation in Norway for the past three years) for all nickel ore mined in North America, have been secured, after full and satisfactory investigation as to its merits by four different experts.

"The sheet nickel and copper produced under this method are ninety-nine per cent. fine and the form in which nickel is turned out by this process has in

the past commanded a price of five cents per pound more than nickel not refined electrolytically.

**"MANAGEMENT.**

"The operations of the company will be in the hands of the managing director, Mr. J. E. McAllister, who for the past ten years has been in active charge of successful metallurgical enterprises of this type. His experience and record, not only as an engineer, but in the successful application of technical knowledge to industrial business, especially qualify him to fill this important position. The heads of departments have been selected from men who have either been associated with him in the past or who are specially fitted, by knowledge and experience, to conduct the work of each branch.

**"ESTIMATED EARNINGS.**

"The operating department of the corporation estimates a total cost per ton, of \$6.60; this allowing for contingencies and including all expenditure from ore in place to the sale of the contained metals. Operations are to be conducted upon a basis of 540,000 tons of ore per annum, from which will be extracted an average of 30 pounds of nickel, 12 pounds of copper, and \$1.00 in precious metals per ton.

"The American quotations for electrolytically refined nickel have ranged from 45 cents to 50 cents per pound for the past two years (see United States Government Reports, also 'Engineering and Mining Journal' quotations), but assuming a price of 30 cents per pound for nickel and 13 cents per pound for copper, the following earning basis will result:

Nickel, 30 lbs. at 30 cents.....	9.00
Copper, 12 lbs. at 13 cents....	1.56
Precious metals .....	1.00
	\$11.56
Deduct operating costs .....	6.60
	\$4.96
Net profit per ton of ore ....	\$4.96
Net profit per annum, 540,000 tons at	\$2,678,400.
Deduct 6% interest on \$10,000,000 Debenture	
Stock .....	\$600,000
Annual Sinking Fund,	
say .....	600,000
	\$1,200,000
Balance available for \$20,000,000	
Common Stock (or about 7½%)	1,478,400

**"DIRECTORS.**

"Dr. F. S. Pearson, M.I.C.E., President, President of Brazilian Traction, Light & Power Co.; J. Frater Taylor, Vice-President, Managing Director Lake Superior Corporation; J. E. McAllister, Vice-President and Managing Director; Benjamin B. Lawrence, Consulting Engineer, New York; E. R. Wood, Director Canadian Bank of Commerce; Walter Gow, Director Brazilian Traction, Light & Power Co., Miller Lash, Director Mexican Light & Power Company."

The foregoing may be accepted as the general purpose of the influential promoters, who expect to market the metallic contents of 540,000 tons of lower grade ore than has been treated by other companies—and to do it at a handsome profit with the Hybinette process. Of course the item "precious metals" is something new in the per ton profit on these ores, but if the world will take all the nickel necessary to carry the capital of the three producing companies, Canada cannot complain and will

welcome the momentum. Perhaps it should here be reiterated that the International Company has no fixed charges; nor are the debentures of the Canadian Nickel Corporation designed to be a burden in case of a struggle for markets. With the Canadian Nickel Corporation it becomes a matter of internal economics and ability to assert in the nickel trade. In this connection Dr. Coleman, who visited Norway in 1911, has this to say encouragingly with reference to what Messrs. Hybinette, Borthen and Henriksen are doing there with ores similar in character to those of the Sudbury District:

"Mr. Hybinette states that the cost of mining the Evje ore is \$1.25 per ton, and that the smelting to low grade matte amounts to about as much; but that the second smelting costs about \$20 per ton of high grade matte. One hundred men are employed at the mine and as many at the smelter.

"The little establishment at Evje is interesting as a contrast with the great smelting plants at Copper Cliff and Coniston; and it is rather surprising to find so modest a plant with such simple methods able to compete successfully with these large, costly and highly organized enterprises.

"The high grade matte is shipped by narrow gauge railway to Kristiansands, the seaport at the end of the valley, to the refining plant which is under the charge of Mr. V. Hybinette. The works, which are a little west of the city, have been in operation for over a year and have been so successful that plans are under way for a large increase in the plant. I am under obligations to Mr. Hybinette for taking me through the works and explaining the process, which is in accordance with United States patents No. 805,550 and No. 805,969, taken out in 1895, and first used in the plant in the Southern States (Missouri) and now owned by the Dominion Nickel Copper Company. As this electrolytic process is described in the patents, it will be unnecessary to refer to its features in detail at this point.

"At the time of my visit—June, 1911, about one ton of nickel was produced a day, having a composition as follows:

Nickel .....	98.70%
Copper .....	0.07%
Iron .....	0.63%
Sulphur .....	0.02%
Arsenic .....	0.05%
Cobalt .....	0.90%

"In a general way it may be said that the matte is roasted to convert the metals into oxides, then leached with weak sulphuric acid, which extracts principally the copper. The residue is heated with sulphuric acid in a temperature at which hydrous sulphates do not exist, and is again leached with weak sulphuric acid to extract copper. The residue is then heated with hydrochloric acid to a temperature sufficiently high for partial decomposition of the anhydrous chlorides and again leached with weak acid, the heatings being repeated, if necessary, in order to obtain a residue of nickel oxide suitable for further treatment."

These generalizations bearing on the Hybinette process are specially apt, since the process has been a controversial issue in the Canadian nickel country. They are more so now, in view of the advent of the Canadian Nickel Corporation, for which Mr. O'Brien bought the rights some years ago. The process has been employed at Nor-

way for about three years and the promoters of the Canadian Nickel Corporation in their prospectus leave no room to doubt its feasibility in Sudbury District practice, notwithstanding the lower percentages, of the nickel-copper and copper, as compared with the grade of ore heretofore treated by the International and Mond Companies. On this point Mr. J. E. McAllister has reported:

#### "REFINING AND SEPARATION OF THE METALS.

"For this purpose the process which has been in use for more than two years past by A. S. Kristiansands, *Nikel-raffineringsvork*, at Kristiansands, Norway, has been adopted, the rights for its use having been purchased for all ore mined on the Continent of North America. By this process the nickel and copper are separated by electrolysis; the precious metals, chiefly platinum and gold, being recovered from the tank residues. The commercial success of the process has been fully demonstrated by the operations in Norway, and in the investigation of it the writer has had the assistance of Messrs. R. W. Deacon and C. S. Lomax, of New York, and W. A. Heywood, of London.

"The investigation of the technical and commercial work of the process has been exhaustive and satisfactory, the engineers referred to, as well as the writer, having spent some time at the Norwegian plant for this purpose.

"Its working costs have been considered over a period of two years, from which estimates have been compiled for the operation of the process in Canada under conditions which obtain there. The sheet nickel and copper are 99 per cent. fine, and the form in which the nickel is turned out has in the past commanded a price of 5 cents per pound more than the market quotations of nickel which is not refined electrolytically."

#### "OPERATING COSTS AND REVENUE.

"The ore blocked out by prospecting and development operations to May 1st, 1912, amounts to 6,800,000 tons, as follows:

Whistle and Wild Cat mines..	1,400,000 tons.
Murray and Elsie mines.....	4,665,000 tons.
Nickel Lake, Gertrude, etc....	735,000 tons.
	6,800,000 tons.

"In addition, there is a large tonnage of lower-grade ore in the Whistle and Wild Cat property, and the company has also in the Falconbridge property 2,500,000 of lower-grade ore, but as this will not be available until suitable means of mechanical concentration is adopted, it is not taken account of in the figures which follow. Its possibilities, however, must not be lost sight of.

"The average contents of the 6,800,000 tons specified above will be 51.31 lbs. of combined nickel and copper and \$1.15 precious metals (platinum, gold and silver) per ton of ore, from which will be extracted 30 lbs. of nickel, 12 lbs. of copper and \$1 in precious metals. It is intended that operations shall be conducted upon a basis of the delivery of 45,000 tons of ore monthly to the reduction works, or 540,000 tons per annum, and at this capacity the total expenditure to cover all operations is estimated not to exceed \$6.60 per ton of ore handled."

(To be continued.)

## SYDNEY COAL FIELD\*

By G. A. Young.

The name, Sydney coal field, is applied to the area of Carboniferous strata fringing the north-eastern coast of Cape Breton for above 30 miles from Cape Dauphin on the west, to Mira Bay on the east. The area occupied by these measures amounts to about 300 square miles, of which total about 50 square miles is underlain by the Productive Coal Measures. In addition to the land area of the Productive Coal Measures, there is, by reason of the low seaward dip of the strata, a very considerable submarine area from which coal may be won.

The Sydney Carboniferous basin is notable for the splendid sections exposed along the coast and for the great thickness of the strata, which, in the vicinity of Sydney harbour, reaches approximately 12,600 feet. The section is characterized by the apparent absence of pronounced stratigraphical breaks. In general, the geological structure is simple in form, the angles of dip low, and although a few prominent faults occur, the greater part of the field is free from them.

By reason of a series of low folds and certain indentations of the coast, the coal field is naturally divisible into six coal basins or districts. All of these with but one exception contain, besides a number of minor seams, 5 to 8 seams of coal varying from 2 feet to 13 feet in thickness. The total thickness of coal in seams that may be workable varies in the five main basins from 23 feet up to 47 feet. The coal is of a bituminous variety and in 1911 the total production amounted to above 4,900,000 tons. The individual seams are traceable for miles along the strike, in fact many of them are believed to extend throughout the whole length of the field. The individual seams vary somewhat in quality along the strike, change in thickness in a rather remarkable manner, and in some cases what is one seam in one locality becomes two in another, because of the greatly increased thickness of an elsewhere relatively insignificant parting.

The fund of general geological information concerning the Sydney Carboniferous area is contained, almost entirely, in early reports by Charles Robb and Hugh Fletcher, published by the Geological Survey in the '70s, and in a series of maps by Fletcher which are, in part, revisions of earlier editions. Important contributions to the geology of the district were made by Richard Brown, at one time manager of a coal company operating in the field. The varied and striking palæobotanical material described by Bunbury and Dawson was mainly collected by Brown, chiefly from the North Sydney area and in no small part from one shale bed overlying the main seam. From this single horizon, it is stated by Brown, that over 90 plant species were obtained.

The Carboniferous strata of the district have been grouped and mapped under four divisions, of which the highest, the Productive Coal Measures, embraces the youngest consolidated rocks in the region. The different divisions, in a general way, are displayed over long areas trending east and west, parallel to the coast line—the highest divisions bordering the coast, the lower divisions developed inland towards the south and resting on Cambrian and Pre-Cambrian strata. The Pre-Cambrian comprises plutonic, volcanic, and highly metamorphosed sedimentary strata; the Cambrian is mainly of sediments which are in part fossiliferous.

The Carboniferous area, bordered on the north and east by the Atlantic, is essentially a low, rolling country, seldom rising higher than 350 feet above the sea, while the Pre-Cambrian and Cambrian areas, situated to the south and west, are more broken, and in part consist of long ranges of high hills rising abruptly from partly encircling Carboniferous lowlands, to heights of from 500 to 1,000 feet above sea level. The coast line is broken by bays and channels of the sea running inland in a south-westerly direction. One of the larger of these indentations is that of Sydney harbour, situated towards the centre of the basin and forking towards its head into two arms, each of which is continued inland by a long valley. Farther west, cutting through the Carboniferous lowland, are two long channels leading south-westward into the salt water Bras d'Or Lake, which occupies so much of the central part of Cape Breton Island.

The general south-westerly trend of the depressions occupied by the sea, of the courses of the axes of folds in the Carboniferous, and of the high ranges of Pre-Cambrian and Cambrian strata, is a marked feature. The presence of the Carboniferous over the lowlands that border and penetrate the high hills of Pre-Cambrian and Cambrian rocks, the overlapping of various divisions of the Carboniferous on these ancient strata, the relatively undisturbed attitude and the comparatively coarse nature of the bulk of the thick series of Carboniferous measures are signs which point to the conclusion that the topography of the present day in some measure reflects that of early Carboniferous time.

The nearness to the old shore of the portion of the Carboniferous basin still preserved doubtless, in part at least, explains the great volume and general characters of the sediments. Possibly a considerable proportion of the supposed thickness may be explained as due to dip of deposition.

The general similarity of the Carboniferous measures as displayed in Cape Breton, to those on the mainland of Nova Scotia and over New Brunswick, along the southern and western edge of the Gulf of St. Lawrence; the resemblance of these beds to those developed in Newfoundland on the east side of the St. Lawrence Gulf; and the occurrence of Carboniferous strata on the Magdalen Islands, situated towards the centre of the hydrographic basin, have led various observers to believe that Sydney Carboniferous area represents a remnant of the southern border of a once continuous basin of Carboniferous strata that may have occupied the greater part of the area of the Gulf of St. Lawrence.

The Carboniferous section of the Sydney field is customarily divided into the following groups, tabulated in descending order with approximate thickness as developed in the vicinity of Sydney harbour.

Productive Coal Measures . . . . .	1,970 ft.
Millstone Grit . . . . .	3,625 ft.
Limestone series . . . . .	4,500 ft.
Conglomerate series . . . . .	2,525 ft.
Total . . . . .	12,620 ft.

The Conglomerate series consists essentially of red conglomerates, sandstones and shales. The conglomerates predominate and their water-worn pebbles and boulders are often of large size. Calcareous material in

\*Extracts from Guide Book No. 1, published by the Geological Survey for the Twelfth International Geological Congress, August, 1913.

places forms the matrix of the conglomerates and occasional impure beds of limestone occur.

The Limestone series includes a great thickness of sandstone and shales, red and grey or green in colour, also conglomerate horizons, and many beds of limestone that frequently are fossiliferous. Only one bed of gypsum is known to occur in this series in the neighbourhood of Sydney harbour, though a few miles to the west and in other areas of the Carboniferous, gypsum forms an important member of the series.

The Millstone Grit is largely composed of coarse and fine, grey or green sandstones in part conglomeratic, especially towards the base of the series, and shales usually dark in colour. In the eastern part of the field shales are relatively more abundant, are more largely red, and at least one important coal seam is present, whereas, to the west the shales are generally dark, are less abundant, the conglomeratic phases of the sandstone are more prominent and coal seams are absent or relatively unimportant.

The Productive Coal Measures are largely shales, commonly dark coloured, but also in part red or green, and light coloured sandstones. Thin, persistent beds of dark limestone form a characteristic feature of the lower portion of the division. In various measured sections there is, on an average, 24 coal seams, with a total average thickness of 46 feet of coal.

#### **ALLIS-CHALMERS MANUFACTURING COMPANY'S PULVERATOR.**

The Allis-Chalmers Pulverator is a crushing and pulverizing machine designed on a new principle. It might be thought, at first glance, to resemble the ordinary hammer mill but differs essentially in its action, as will be seen from the explanation given below.

The Pulverator is small, compact and easily mounted on a light foundation on account of its being evenly balanced.

It is designed as a crusher for the reduction of material from 3 inches or finer to a size of which all will pass a 20-mesh screen if necessary. The materials which it handles to advantage include limestone for cement making, concrete, agricultural purposes, etc., coal shale, feldspar, phosphate rock, gypsum, bauxite, slag and similar substances.

The machine can be regulated so as to provide for a 1 inch product down to any size desired, as low as 20-mesh, and on materials not too abrasive a product even finer than 20-mesh may be obtained. When a machine is crushing 20-mesh material there is a large quantity of the output much finer than this size and tests made on ordinary limestones indicate that from 40 per cent. to 50 per cent. of the product passes 100-mesh.

The capacity is proportional to the size of the product and the character of the feed. It varies from 5 to 7 tons an hour up to 15 tons, with consumption of a corresponding amount of powers, ranging from 25 to 40 h.p. for the outputs mentioned.

The wear is entirely upon the hammers, the lining plates and the grate bars, all of which are easily renewable.

The material is fed into the machine by a feeder or feed spout located in one of the upper corners and is immediately struck upward by one of the swiftly revolving hammers. It is thrown against the involute surface of the liners, which are set at such an angle that the material re-bounds and is again struck by the hammers, this action being repeated until the material is finely pulverized. The fine material is carried forward by the air currents and passes out between the involute liners or

grate bars in the bottom of the casing. The hammers revolve very rapidly and are sufficiently heavy to produce a very effective blow even on a large lump of material.

The top and sides of the casing are protected by involute liners made of hard cast iron and are held in place by means of countersunk head bolts. Involute grate bars, set concentric with the line of travel of the hammers, form the bottom of the crushing chamber. These bars or liners are placed from  $\frac{5}{8}$  inch to 1 inch apart, the distance depending upon the nature of the material to be crushed, and the finished material is thus permitted to pass out between them. The grate bars slip into grooves in the casing and rest against each other.

Where the material to be crushed is inclined to pack in the machine the ordinary grate bars, similar to those generally used on a hammer mill, are employed instead of the involute type.

The shaft is carried in heavy ring oiling dustproof bearings located on the outside of the casing. The driving pulley is placed on this shaft outside of one of the bearings, and the flywheel is similarly placed on the opposite side.

A solid cast steel centre, which has a circular flange or disc on each end, is mounted on the revolving shaft and the "U" shaped hammers are attached to these discs by means of suitable pins.

The hammers are made in three pieces. The two side pieces which are fastened to the disc by a heavy pin, as explained above, screw into the shoe or wearing part of the hammer, which is made of special tool steel. The side pieces of the hammers are made in pairs of three different lengths, hammers of equal length being placed diametrically opposite each other. The shoes or wearing parts are made in three different thicknesses so that as the hammers become worn the thinnest one may be removed and the two remaining sets moved up to the next longer side pieces and a new shoe placed upon the first set of side pieces. It will readily be seen that this arrangement will greatly increase the life of the hammers and consequently reduce the cost of repairs.

The feeder has been specially designed for this mill and incorporates the well-known principle of the Gates feeder. It is adjustable within a wide range by means of a slotted crank. The crank on the sprocket or pulley provides a rapid and convenient means of stopping for adjustment. The power to operate the feeder is taken from the shaft near the balance wheel. This feeder is so arranged that the operator can at all times see just what material is being fed to the pulverator.

#### **GRANBY CO.'S NEW SMELTER.**

Mr. F. M. Sylvester, assistant to the general manager of the Granby Consolidated Mining, Smelting & Power Co., Ltd., returned to Spokane, Washington, on September 27 after having spent several weeks at Granby Bay, Observatory Inlet, B.C., where the company is putting in a 2,000-ton smelting plant. He said that although rain had fallen every day for three weeks, there had not been any serious interruption to construction or equipment work on the new smeltery and hydro-electric power system. The buildings for both smelter and power plant are nearing completion. Practically all the machinery and other equipment has been received at Granby Bay, and much of it put in place. Altogether, both construction and installation have been advanced to a stage that promises the early completion of the works, so that it is expected ore-production and smelting operations will be commenced early in 1914.



### MINING EXPOSITION AT PHILADELPHIA.

The First National Mining Exposition, to be given in Philadelphia, October 17 to 25, under the auspices of the American Mining Congress, has gone far beyond the expectation of its promoters. Conceived but three months ago, its artistic and business success were assured fully a month ago. Now it promises to be one of the greatest trade gatherings ever held in this country and will undoubtedly result in great good to the industry.

"The response made by the mining men of the United States to the call for this Exposition," said Richard L. Humphrey, director of the Exposition, "only serves to indicate what a real need there has been existing for such an Exposition. It was quickly realized that this would not be merely a show for the curious, with doubtful results to the exhibitors. The American Mining Congress, which is to hold its convention at the same time, will bring to Philadelphia more than 2,000 of the leading mining men of the country, and these will attend the Exposition in addition to the men who will come solely for the Exposition. Considering the short time that the Exposition has been under way, I believe that it will be a most remarkable show."

A number of the exhibitors and their exhibits are as follows: Westinghouse Electric & Mfg. Co., Pittsburg, and Baldwin Locomotive Company, Philadelphia, mine locomotives; Western Electric Company, New York, mine telephones; Milwaukee Locomotive Company, Milwaukee, Wis., gasoline mine locomotives; Universal Portland Cement Company, Chicago, Ill.; use of cement in mining; Streeter-Amet Weighing & Recording Company, Chicago, automatic weight recorder for mine tipples; the Lobdell Wheel Car Company, Wilmington, Del., car wheels and axles as applied to mining cars; J. S. McChesney & Company, Chicago, mine supplies; Williams Patent Crusher & Pulverizer Company, Chicago, a coal crusher; Atlantic Refining Company, Philadelphia, lubricating oils; Hirsch Electric Mine Lamp Company, Philadelphia, miner's cap and lamp; Henry Troemner, Philadelphia, assay and analytical balances; West Virginia Rail Company, Huntington, W. Va., steel rails; Keuffel & Esser Co., Hoboken, N.J., mathematical and surveying instruments; C. O. Bartlett & Snow Co., Cleveland, O., working model of a complete coal handling plant; American Tempering Company, Springfield, Ill., a system of welding; Hyatt Roller Bearing Company, Newark, N.J., mine car wheels with roller bearings; Roessler & Hasslacher Chemical Co., New York, the sodium compounds used in mining; Link Belt Company, Chicago, elevating, conveying and transmission machinery; Fairmont Mining Machinery Company, Fairmont, W. Va., portable electric mine pump, etc.; Draeger Oxygen Apparatus Company, Pittsburg, Pa., life saving apparatus; General Electric Company, Schenectady, N.Y., electric machinery and appliances; Jeffrey Manufacturing Company, Columbus, Ohio, storage battery locomotive, etc.; John A. Roebling's Sons Company, Trenton, N.J., wire ropes and cables; the Alexander Milburn Company, Baltimore, Md., carbide lamps, etc.; Main Belting Company, Philadelphia, belting; Electric Storage Battery Company, Philadelphia, storage batteries designed for mine locomotives; Goodman Manufacturing Co., coal mining machinery; John G. Scott, Girardsville, Pa., patented transmission rope clip; Edison Storage Battery Co., Orange, N.J., storage batteries and electric mine lamps.

In addition to the above, there are twenty or more representative mining concerns that are just closing up negotiations for space in the Exposition. This, it is expected, will make the First National Mining Exposition a wonderful success.

### HOLLINGER.

The report for the period of four weeks ending September 9, 1913, shows a gross profit of \$145,866.79. Operating costs were \$61,899.48, an average of \$5.179 per ton of ore milled. The approximate average value of all ore hoisted was \$17.94. 6,033 tons of the ore was from development work, and 6,363 tons from stopes.

The mill treated 12,264 tons of ore of which 311 tons were treated for Acme Gold Mines, Ltd. The average value of the ore treated was \$17.80. The average milling cost was \$1.376 per ton. Approximate extraction was 96.4 per cent.

Work upon No. 1 vein upon the 425 ft. level is demonstrating that values and widths are about the same as upon the upper levels, and preparations are being made to immediately start sinking to the 550 foot level.

A point of interest to be noted is that practically one-half of the ore milled came from development work.

The main shaft has been holed through from the 300 to the 200 ft. level and is being timbered.

Crosscutting upon the 100 feet level resulted in finding an ore body which shows the same characteristics and high values as does No. 1 vein. The crosscut caught the vein 250 feet north of the supposed northern extremity of No. 1 vein, and as the new ore body lies directly ahead of the old workings it is possible that No. 1 vein may have a greater length than had previously been supposed.

Upon the 300 ft. level an ore body has been picked up by crosscutting which would appear to be No. 8 vein.

The reduction of working cost to \$5.18 per ton is the lowest figure yet reached.

### NEW ROTARY POWER PUMP.

A new type of rotary power pump has just been developed by the Goulds Ffg. Co., Seneca Falls, N.Y.. This pump differs from the rest of the line of pumps of the same capacity in that gear style cams have been substituted for the three-toed cams used in the remainder of the line, and the gears on the end of the cam shafts have been eliminated.

Two sizes are built: No. 1 has a capacity of 25 to 50 gallons per minute at 225 to 450 revolutions, and No. 2 has a capacity of 50 to 100 gallons per minute at 225 to 450 revolutions. Both pumps are suitable for pressures up to 100 pounds or 230 feet elevation.

They are mounted on a cast iron bed plate, fitted with an outboard, bearing and tight and loose pulleys for belt drive. The suction connection is made within the base directly beneath the case and is reached through hand holes in the base. No. 1 has two discharge openings, one tapped for pipe and the other threaded for hose couplings. No. 2 has three discharge openings, two fitted the same as No. 1, and the third fitted with an interchangeable blank flange.

The suction is 3-inch on No. 1 and 4-inch on No. 2. The discharges are for 1½ and 2-inch pipe or hose respectively.

The Goulds line of pumps are for sale in Canada by the Canadian Fairbanks-Morse Co., Limited.

## PERSONAL AND GENERAL

Mr. John P. Clarke, B.A., a graduate of Queen's, Kingston, while employed with a survey party in the Flathead country, Southeast Kootenay, British Columbia, was killed by a tree falling on him and crushing his skull.

Dr. Alfred W. G. Wilson, of the Mines Branch of the Canada Department of Mines, after his return to British Columbia from a trip to Yukon with Excursion C8 of the International Geological Congress, has been making investigations relative to the question of the appointment of a special commission asked for by some members of Kootenay Boards of Trade to enquire into matters connected with the lead and zinc mining industries.

Mr. Cosmo T. Cartwright, assistant engineer, Division of Mineral Resources and Statistics, Mines Branch of the Canada Department of Mines, has been in British Columbia lately, gathering additional information concerning the mining and metallurgical industries of that Province.

Mr. Wm. Watson, for some time manager for the Motherlode Sheep Creek Mining Co., operating a gold mine and stamp mill in Nelson mining division, B.C., has returned to Nelson from a visit to Chicago.

Mr. Jas. McEvoy, who was taken ill with pneumonia while travelling in British Columbia with the C2 Excursion of the International Geological Congress, and had to be placed in a hospital in Vancouver for a time, is now recovered and has returned to Toronto.

Mr. M. K. Rodgers, well-known in British Columbia in connection with the development of the Nickel Plate group of gold mines in Camp Hedley, Similkameen district, and the Hidden Creek copper mines near Observatory Inlet, has lately been revisiting those properties, the great value of which he was the first to recognize and demonstrate by development of large bodies of ore. He had been in Mexico for a year or more previous to his recent return north. As he still holds mining property in Mexico, he intends making Los Angeles, Southern California, his headquarters in the near future.

Mr. Desaix B. Myers, of Los Angeles, California, has been examining the Emerald lead mine, near Salmo, Nelson mining division, B.C.

Mr. Frederick P. Burrall, of New York City, has been investigating mining conditions in the White Bear country, Yukon Territory, and across the International Boundary line from that region, in the Shushanna gold field, Alaska.

M. Eriera de Castro, a Portugese mining engineer, recently accompanied Mr. W. E. Cory, of New York, formerly president of the United States Steel Corporation, now one of the largest shareholders in the Hedley Gold Mining Co., and Mr. J. B. Worden, of Philadelphia, on a visit to the Hedley Co.'s Nickel Plate group of gold mines and 40-stamp mill in Camp Hedley, Similkameen, B.C.

Mr. Chas. Camsell, of the Geological Survey of Canada, whose lengthy memoir on the "Geology and Ore Deposits of Hedley Mining District, British Columbia," was published in 1910 by the Canada Department of mines, lately paid another visit to the Nickel Plate mines to obtain additional geological and mineralogical data made available by the extensive underground development work done since his report on the district was prepared.

Mr. C. H. McDougall, superintendent of the Consolidated Mining & Smelting Co.'s St. Eugene and Sullivan Group lead-silver mines in East Kootenay, B.C., was ill in the hospital at Cranbrook during the latter part of September. Latest news was that he was recovering.

Mr. S. J. Schofield, of the Geological Survey of Canada, with his field party, last month went up Crawford Creek from Kootenay Lake to cross the mountain divide between West and East Kootenay, in which latter part of British Columbia he has done much geological work in recent years.

Mr. L. B. Reynolds has returned to Nelson, B.C., after having spent two or three months in the Eastern United States.

Mr. W. R. Wilson, of Fernie, B.C., general manager for the Crow's Nest Pass Coal Co., was a visitor to Spokane, Washington, U.S.A., during the "Inland Empire Fair" week in that city in the latter part of September.

Mr. J. L. Warner, who several years ago was instrumental in attracting public attention to promising gold mining properties in Sheep Creek camp, Nelson mining division, B.C., and of late has been giving his attention to the South Belt of Rossland camp, in the same Province, was married last month in Spokane, Washington, and now has his home in Rossland.

Mr. John Hopp, of Barkerville, who has for years been operating on a comparatively large scale, hydraulic placer-gold mines in Cariboo district, B.C., was in Victoria last month seeking an injunction to prevent interference with his Lowhee water ditch. Last summer the manager of the neighbouring mining property was sent to jail for having blown up part of the Lowhee ditch with dynamite; latterly gates have been surreptitiously opened on different occasions and the water run to waste, so as to prevent Mr. Hopp from using it in washing gold-bearing gravel.

Mr. E. S. Moore was in Toronto on October 1st on returning from a trip to the Yukon.

Mr. Roy Margeneau has joined the staff of the Tough-Oakes Mining Company at Kirkland Lake, Ont.

Messrs. Weigand, Schenk, Morel, Fermor, Luttmann-Johnson, Mouye and Zoude Mrs. Fermor and Miss Raisin, members of the International Geological Congress, visited Porcupine and Cobalt last week. Mr. R. G. McConnell was in charge of the party. Mr. A. A. Cole and A. G. Burrows acted as guides.

The S. Flory Mfg. Co., Bangor, whose plant was destroyed by fire July 31st, have erected temporary buildings equipped with improved high grade machinery and are ready to take care of orders as in the past.

The Roberts and Schaefer Company, Chicago, have opened a laboratory for analyzing and testing fuels.

Mr. Chas. Watson has been appointed manager of the Cobalt Townsite Mining Company, to succeed Mr. Bailey.

Mr. Stanley Graham has been appointed Professor of Mining Engineering at the Nova Scotia Technical College at Halifax.

Mr. P. A. Robbins has made an examination of the Jupiter mine for the Timmins-McMartin-Dunlap syndicate.

Norman R. Fisher, of the Timiskaming mine, Cobalt, has been appointed general manager of the Pearl Lake mines, but this position will not interfere with his duties at his Cobalt property.

Mr. Harold Roche, who has been superintendent of the North Dome mines in Porcupine for the past three months, has been placed in a similar capacity at the Pearl Lake mines, following the resignation of the general manager, Col. Stevenson.

Mr. J. B. Tyrrell will leave shortly for London, England. His address while there will be 224 Salisbury House, E.C.

Mr. J. V. Culbert is now superintendent of the Wasabika mines, West Shiningtree, Ontario.

The Canadian Allis-Chalmers Company has issued a new catalogue of mechanical power transmission machinery. It is a cloth-bound book of 300 pages and contains many useful general data as well as descriptions and price lists of the company's machinery.

The Canadian General Electric Co. has issued a bulletin on fractional horse power motors and their application.

The Canadian Collieries (Dunsmuir) have decided to install an extensive electric driven pumping plant. There

will be four separate units. Two will be driven by 75 h.p. a.c. motors, and a third by a 75 d.c. motor, each unit being capable of delivering 350 gallons per minute against a head of 370 feet. The fourth unit, consisting of two pumps working in series, will deliver 350 gallons per minute, against a head of 740 feet. The pumps will be built by Canadian Allis-Chalmers, Limited, and the motors by Canadian General Electric Co., Limited.

Mr. G. F. S. Anderson, formerly of the Buffalo mine, has taken charge of the Lucky Cross gold mine at Swastika, Ont.

Mr. C. H. Hitchcock, formerly in charge of exploration at Murray mine for the Dominion Nickel Co., has been appointed geologist for the Canadian Copper Co.

Mr. F. M. Sylvester, formerly assistant manager, has been appointed general manager of the Granby, Consolidated Mining, Smelting and Power Co., to succeed Mr. J. P. Graves.

Prof. J. C. Gwillim has returned to Kingston to resume his duties at the School of Mining, after spending several months in Western Canada mining districts.

## SPECIAL CORRESPONDENCE

### BRITISH COLUMBIA

There has been nothing unusual, other than labour troubles at some Vancouver Island coal mines, to interfere with the progress of mining in the province during the latter half of September. Weather conditions have been favourable in the metal mining districts; in the Crowsnest coal field there has been the customary occasional shortage of railway cars that is experienced every year at wheat harvest time, and the result has been that the miners have not been fully employed, losing time whenever there were not cars to take away the coal mined.

On Vancouver island there has been some advancement made toward a general resumption of operations at the mines at which a total suspension of work followed the August excesses of strikers. The Cumberland mines of the Canadian Collieries (Dunsmuir) Limited, have been worked throughout the troubled times, as is shown by their record of output of coal—47,800 tons in August, which was the month in which the rioting occurred, and approximately 52,000 tons in September. The company has resumed work at its Extension mines. At South Wellington, the Pacific Coast Coal Mines, Ltd., is working on a small scale, and expects to gradually increase its working force and its output of coal. The Western Fuel Co. has men keeping its mines in shape, as far as practicable, for a resumption of production whenever this shall be decided upon. The only company that has yet recognized the Union Mine Workers of America is the Vancouver-Nanaimo Coal Mining Co., operating the Jingle Pot mine, near Nanaimo; this company ordinarily employs fewer men and mines less coal than the others above-mentioned.

### EAST KOOTENAY.

**Windermere.**—Prospectors are again giving attention to the lower part of Findlay creek, which enters Kootenay river near the northern boundary of Fort Steele mining division. A new discovery of ore containing grey copper and galena is reported as having been made on the south side of the creek, about six

miles up from its mouth, and six mineral claims have been located there. Many years ago this creek was worked for gold by placer miners; later, in the nineties, numerous mineral locations were made on a series of quartz lodes. One of the best known of those properties was the Thunder Hill group, upon which, so stated, \$12,000 was expended, exclusive of the cost of a two-mile tramway to a mill site on Upper Columbia lake, and of a 50-ton lead concentrating mill. The latter has long been idle, the class of ore it was intended to treat not having been found in quantity. There is on the creek what has been known as a copper belt, and it is to that prospectors are now going.

### SLOCAN.

**Silverton.**—The Van-Roi Mining Co.'s managers in British Columbia cabled to the company's office in London the following report for the month of August: "Estimated expenditure for August: Development, \$2,550; capital expenditure, \$174. Exploratory raise, main vein, level 9: Position 216 ft. west of slope 1, level 9. Height of back 80 ft. above level. Advance 50 ft., of which 36 ft. averaged 18 oz. silver, 1 per cent. lead, 13 per cent. zinc across an average width of 24 inches. Crosscut northwards, level 9—1,500 ft. west of portal: Advance 11 ft. Ore has been penetrated averaging 12 oz. silver, 11 per cent. lead, 11 per cent. zinc across an average width of 3 inches. Crosscut southwards, level 9—1,500 ft. west of portal: Advance 10 ft. Ore has been penetrated averaging 12 oz. silver, 11.5 per cent. lead, 16 per cent. zinc across an average width of 33 inches. Crosscut northwards, level 9—860 ft. west of portal: Advance 10 ft. Ore has been penetrated averaging 2 oz. 10 dwt. silver, nil lead, 16 per cent. zinc across an average width of 12 inches. Mill will be ready to start to-morrow."

### NELSON.

The resident county court judge has delivered a judgment of much interest to mining men of British Columbia. Some miners had obtained a lien under the Mechanics' Lien Act against the Kootenay Gold Mines,

Ltd., operating the Granite-Poorman group of mines and a 20-stamp mill in Nelson mining division. Between \$5,000 and \$6,000 was the total of the claims against the company of 32 of its former employees. The property of the company had been mortgaged, and the mortgagees disputed the right of the employees to a prior claim on it. The judgment follows: "There is no doubt that the main object of the Mechanics' Lien Act was to give every person a lien for work and services upon or in a mine, building, etc., but where prior mortgages existed the provisions of the section dealing with mortgages are inadequate to give relief to lien-holders of the class before us, unless in the proceedings at the trial the increase in the value of the mortgaged premises can be estimated. It is not contended that the work done in this instance increased the value of the premises, and the section just referred to would have to be read out of the Act before judgment could be given as against the mortgagees' interests. A high judicial authority has decided that 'it is a serious matter to hold that where the main object of a statute is clear it shall be reduced to nullity by the draftsman's unskilfulness or ignorance of law.' I must, however, hold that insofar as work in taking out ore, unless in strictly development work, the miners and other employees at a mine cannot enforce their liens against the premises or property as against the interests of the mortgagees. I find that the lien-holders have proved their claims as appears in the evidence and direct that the same be paid by the defendant company forthwith. And in default of payment forthwith I direct that the lien-holders may proceed by sale or otherwise as may be further directed, as agreed upon by all parties interested, against the equity in the premises owned by the defendant company."

**TRAIL CREEK DIVISION.**

Ore receipts at the Consolidated Mining & Smelting Co.'s works at Trail during four weeks ended Sept. 25, were as under:

**East Kootenay—**

From	Tons.	Tons.
Monarch . . . . .	35	
St. Eugene . . . . .	116	
Sullivan . . . . .	2,628	
		2,779

**Ainsworth—**

Bluebell . . . . .	630	
No. 1 . . . . .	385	
Panama . . . . .	70	
Retallaek & Co. . . . .	173	
Silver Hoard . . . . .	235	
Utica . . . . .	13	
		1,506

**Slocan—**

Eastmont . . . . .	32	
Hewitt . . . . .	232	
Mountain Con. . . . .	16	
Rambler-Cariboo . . . . .	300	
Reco . . . . .	8	
Richmond-Eureka . . . . .	116	
Ruth . . . . .	39	
Slocan Star . . . . .	60	
Standard . . . . .	934	
Surprise . . . . .	20	
		1,757

**Nelson—**

Emerald . . . . .	144	
Molly Gibson . . . . .	174	
Queen . . . . .	40	
Silver King . . . . .	257	
Yankee Girl . . . . .	326	
		941

**Rossland—**

Centre Star Group . . . . .	13,083	
Le Roi . . . . .	5,499	
Josie (Le Roi No. 2, Ltd.) . . . . .	1,847	
		20,429

**Lardeau—**

Ferguson . . . . .		37
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**Kamloops—**

Iron Mask . . . . .		32
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**State of Washington, U.S.A.—**

Ben Hur (Republic Camp) . . . . .	1,744	
Bonanza . . . . .	101	
United Copper . . . . .	47	
		1,892

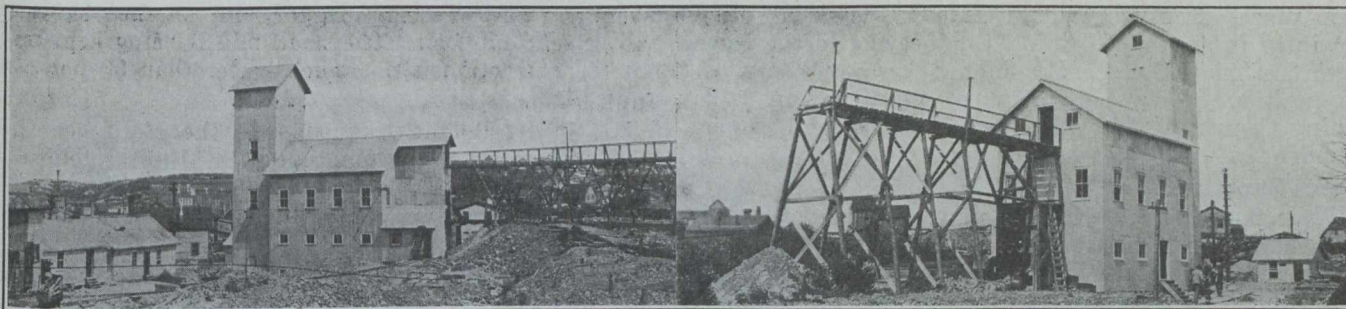
Total . . . . . 29,373

**Rossland.**—The managers of the Le Roi No. 2, Ltd., cabled from Rossland to London the following report: "Josie mine report for August: Shipped 1,620 tons of ore and 55 tons of concentrates. The receipts from smelter are \$17,303, being payment for 1,327 tons of ore shipped, and \$1,007 for 105 tons of concentrates; in all, \$18,310. Estimated costs for corresponding period: Development, \$6,000; ore production, \$12,500; milling, \$1,300. Total \$19,800. North Annie Drift, 500-ft. level: Advance, 64 ft., of which 40 ft. averaged 15 dwt. gold, 8.5 per cent copper, across an average width of 9 inches. Poorman Drift, 900-ft. level: Advance 17 ft. Also sunk 4 ft. for the purpose of connecting for ventilation. Drift 44, 900-ft. level: Advance 15 ft., of which the whole averaged 2 oz. 18 dwt. gold, 0.875 per cent. copper, across an average width of 39 inches. Raise 728, 700-ft. level: Back is 83 ft. above level. Advance 18 ft. Crosscut and drift 538, 500-ft. level: To investigate ore found in Diamond Drill hole No. 340. Advance 23 ft. crosscut and 20 ft. driven, of which 20 ft. averaged 4 dwt. gold, and 3.5 per cent. copper across 31 inches."

**VANCOUVER ISLAND.**

**Victoria.**—Since Mr. Chas. H. Clapp left Vancouver Island for Arizona, in the early part of September, geological investigations have been continued in Sooke district, west of Victoria, by other members of the staff of the Geological Survey of Canada. It is understood that occurrences of copper ore in that district are regarded as of sufficient promise to warrant much development work being done to explore them.

The Canadian Goldfields Syndicate, Ltd., has declared its dividend No. 17; amount with bonus one and one-half per cent., on the company's capital stock. This company has its head office in Montreal; its mining property is in British Columbia, but it is not now, nor has it been for a number of years, doing any mining. It derives its profits available for distribution among its shareholders from dividends it receives from the Consolidated Mining & Smelting Company of Canada, Ltd. Years ago it sold to the St. Eugene Mining Co. a group of mineral claims, now part of the St. Eugene mine group at Moyie, East Kootenay, for which it received shares in the St. Eugene Co., and, later shares in the Consolidated Co.



Shaft-House, Cobalt Townsite mine

## COBALT, GOWGANDA, AND SOUTH LORRAIN

### Cobalt Townsite—

Following the meeting of the directors of the English syndicate which controls the Cobalt Townsite, the Casey Cobalt, the Cobalt Lake, the City of Cobalt, and the Townsite Extension, there have been several important developments. The purchase of the Northern Customs mill has been ratified and preparations are being made to rush the work necessary to connect the City of Cobalt with that plant, a long tramway being built from the shaft to the mill. To finance the purchase of the mill, or partly finance it, the capitalization of the City of Cobalt Mining Company is being raised from \$1,500,000 to \$2,100,000. The head office of the City of Cobalt is also being transferred from Cobalt, where it has always been, to Toronto. Another change is the placing of Mr. Chas. Watson as manager of the Cobalt Townsite. He is already in charge of the City of Cobalt for the same interests. Directly the Northern Customs mill is turned over to the English companies in November, the ore which has been piling up on the surface and also in the stopes underground will be treated as far as the capacity of the plant will allow.

The new plant of the Northern Customs concentrator is making excellent progress. All the concrete work is finished and framing has commenced. The switch into the property has been completed, and, when the machinery arrives, it can be taken in without any delay. The water will be piped from Sasaginaga Lake and will be a gravity flow.

The Hudson Bay output for the month of August was considerably higher than usual, this being due to the larger proportion of high grade ore in the shipments. The production for the month amounted to 73,150 ounces. The ore concentrated during the month amounted to 19.40 tons, the heads to the mill ran 21.50 ozs. to the ton. The extraction was 86.90 per cent. The stopes are being carried very wide at the Hudson Bay now.

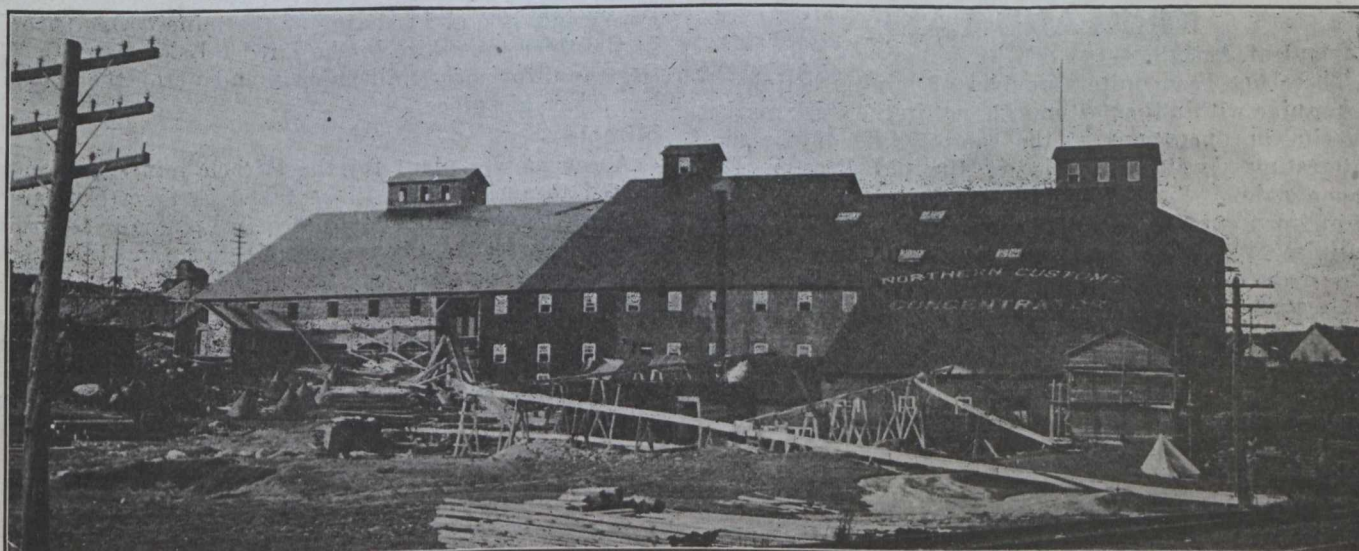
The many friends of Mr. Stanley Graham will congratulate him on the appointment he has received as the professor of Mining Engineering at the Nova Scotia Technical College at Halifax. A graduate of Queen's, Mr. Graham had experience in Mexico before he came to Northern Ontario. His last appointment was superintendent of the Peterson Lake Mining Company.

### Kerr Lake—

No great surprise is entertained in camp at the good showing of the Kerr Lake Mining Company in the annual report. It has been known for some time that Mr. Livermore's policy of bringing development work up to date has yielded excellent results. The report, too, was drafted before the finds were made under the drained portion of Kerr Lake.

### Cobalt Lake—

It is stated by the management of the Cobalt Lake Mining Company that the basis of 100,000 ounces per month was maintained during September. A new development was experienced from the No. 2 crosscut when a two-inch vein carrying occasional patches of high grade ore was cut. The systematic exploration of the northern end of the lake is being proceeded with.



Northern Customs Concentrator, Cobalt

In place of Mr. Stanley Graham who has been appointed professor of Mining Engineering in the Nova Scotia Technical College, Mr. John Baker has been given the position of superintendent of the Peterson Lake Mining Company. Mr. Baker was formerly mill superintendent of the Cobalt Lake Mining Company.

#### Seneca-Superior—

While the statement that a new vein had been cut on the Seneca Superior is not true, it is accurate that the main vein has been found to carry its values 130 ft. below the 200-foot level in a winze which is now being sunk. It is still in conglomerate at that point. The contact has also been reached and some good ore has been found in the Keewatin, but no hopes are being founded on this.

#### More Geologists—

The very last party of geologists has been entertained and has gone. This small but distinguished party from the Yukon had not included Cobalt in their original itinerary, but so insistent was the demand to see Northern Ontario that about twelve of them saw the Porcupine and Cobalt camps.

#### Marketing the Ore and Bullion—

Owing to the restricted market for Cobalt ores, some difficulty is being experienced in disposing of the silver both as concentrates and crude ore. The situation has been aggravated by the determination of the two A. S. & R. smelters to refuse all ores that run higher than 7 per cent. in arsenic. As practically all high grade Cobalt ores contain considerably more arsenic than this, this virtually means the closing of the Perth Amboy and Denver smelters to the mine managers of the camp. The Coniagas smelter at Thorold can handle little more than the output of the Coniagas, and the Townshite and Deloro must give first choice to O'Brien and Miller Lake O'Brien at Gowganda. The Pennsylvania smelter at Carnegie has closed down. It is understood that the smelter at Orillia is to be rebuilt and there is a much better market for Cobalt ores abroad than formerly.

The steamship companies plying out of Canadian ports have decided to raise their rates for handling silver bullion, and it is therefore probable that the bulk of the Cobalt bullion which has been marketed in London will now go to New York. The express companies are, however, desirous of retaining the business and a way may yet be found for shipping direct to the London market.

## PORCUPINE, SWASTIKA AND KIRKLAND LAKE

#### Revival of Activity—

There has been quite a revival of mining activity in Porcupine within the past month, not in the stock market, but in the operations in the camp. One of the most interesting developments is on the old Preston East Dome claims which reverted to its former owners. Out of an open cut on the No. 7 vein to the west of the camp buildings twenty and a half tons of gold ore were taken. The open cut was 30 feet long by 12 feet deep. The high grade streak of ore was 25 inches wide, but the open cut was two to three feet wide. Out of this approximately 24 tons of ore were taken and a total recovery of 210 ounces of gold made. A shaft is now being sunk at one end of the open cut from which another level will be developed.

#### Tough-Oakes—

It is understood that the contact between the conglomerate and the porphyry has been reached at or about the 200-foot level of the Tough-Oakes property. Remarkable high grade ore is being mined at the 100-foot

level, and this is being bagged and another shipment will be sent out soon. The small mill is being kept busy, but the extraction is not much better than 50 per cent.

#### Jupiter—

Mr. P. A. Robbins, manager of the Hollinger Gold mines, has made an examination of the Jupiter gold mine for the Timmins, McMartin and Dunlap syndicate. The Jupiter mine has been closed down for some months.

#### McIntyre—

What is believed to be the extension of the Dixon system of veins has been cut in the McIntyre shaft at a depth of 390 feet. It will be drifted upon at the 400-foot level. An assay gave \$12 a ton. The main shaft of the McIntyre will be continued to the 600-foot level from the 400-foot level. A lengthy crosscut will be made under Pearl Lake from No. 1 shaft to No. 5.

#### Dome—

The concrete work for the 40-stamp addition to the Dome mill will be completed in a few days when the steel work for the structure will be commenced. It is expected that the enlarged mill will be running about next March. Mr. H. C. Meek has returned from his holiday and is again in charge of operations. Mr. Ambrose Monell and other directors of the Dome will visit the plant this month.

#### Three Nations—

The Three Nations mill in Whitney township is now running. The ten-stamps have been crushing between 49 and 50 tons daily. It is possible that an additional ten stamps will be installed next spring, and a cyanide plant.

#### Acme—

Driving from the 100-foot level of the Hollinger mine, crosscuts are now being made to cut ore bodies on the Acme Gold mines, better known as the Dixon claim. The shaft is being put down from 200 to 500 feet without delay. At the No. 10 shaft, near the McIntyre line, crosscuts are now being made at 150 feet, which is equivalent to the 200-foot level of the main shaft.

#### Schumacher—

A new working shaft for the Schumacher mine will soon be available for hoisting purposes. Four hundred feet south of the old shaft a raise has been started from the 100-foot level to the surface. The new shaft will be one of three compartments. The enlarged plant will be in good working order before the snow flies.

Mr. Edward Yorke, formerly manager of the Hughes Porcupine, is now in charge of the mine d'Or Huronia, in Gauthier township, in the Larder Lake district. Mr. Porteous, formerly mill superintendent of the Vipond, has taken his place.

#### Miracle—

A compressor plant for the Miracle mines is soon expected to arrive. It will be taken in from Connaught station, the claims being situated in Langmuir township. So far only test pits have been put down, but this winter a main working shaft will be started.

It is stated that a mine-rescue apparatus, made in England, which does away with the use of the helmet, weighs only 28 lbs., and it is claimed that a man using it can work in deadly gases more than five hours.

A report from Vancouver, B.C., is to the effect that the company operating the White Pass and Yukon route to Dawson intends to extend its line toward the Chisana or Shushanna gold field, in western Alaska, this extension to be in Canadian territory.

# STATISTICS AND RETURNS

## COBALT ORE SHIPMENTS.

Shipments from the Cobalt camp were exceptionally low during the week ending Oct. 11, both from a standpoint of tonnage and value. Of the seven cars of ore which left the camp, four were of low grade values. In addition to the ore shipments being below the average, the bullion shipments, while fairly high in figures, included but one shipment, that from the Nipissing mine.

The LaRose sent out four cars of low grade during the week, the heaviest low grade shipment in a week from the property since the contract with a local customs concentrator was signed several years ago. One hundred and seventy-five tons were despatched by the LaRose during the week, going to Newark, N.J.

The high grade shippers during the week were the Trethewey, McKinley-Darragh and O'Brien mines, the first named sending to Denver. Last week a shipment from the Cobalt Aladdin company, the new English concern, now working the Silver Queen, was omitted from the list. This car was of high grade ore and the first sent from the Silver Queen property since the balmy days of that company.

The bullion shipment of the week was from the Nipissing mines. The total value was nearly \$75,000.

The ore shipments tabulated as to high and low grade were as follows:

	High	Low	Totals
LaRose. . . . .	0	4	348,600
O'Brien. . . . .	1	0	87,400
McKinley-Darragh. . . . .	1	0	71,665
Trethewey. . . . .	1	0	40,000
	3	4	547,665

The bullion shipments for the week ending Oct. 11, were:

	Bars.	Ounces.	Value.
Nipissing. . . . .	100	118,924.91	\$73,138.82

The shipments for the year to date are:

	Ounces.	Value.
Nipissing. . . . .	4,749,936.33	\$2,719,879.45
Penn-Can. . . . .	14,141.60	8,456.90
Buffalo. . . . .	1,240,607.90	772,301.57
Crown Reserve . . . . .	364,056.00	222,877.25
Dom. Red. . . . .	352,183.40	203,277.15
Townsite. . . . .	36,818.40	30,364.04
Miscellaneous. . . . .	3,920.00	1,623.00
Timiskaming. . . . .	25,561.70	14,948.04
O'Brien. . . . .	146,542.77	78,423.66
Wettlaufer. . . . .	4,715.00	2,925.00
Miller Lake . . . . .	3,710.20	2,053.01
Colonial. . . . .	635.00	374.00
Trethewey. . . . .	13,529.83	8,282.04
Casey Cobalt . . . . .	2,394.00	1,520.00
Kerr Lake . . . . .	67,817.79	40,873.48
Bailey. . . . .	1,839.00	1,103.40
Cobalt Lake . . . . .	1,717.80	996.36
Wettlaufer. . . . .	4,391.00	2,634.60
City of Cobalt . . . . .	1,755.45	1,053.00
Preston E. D. . . . .	3,452.60	2,002.50
Cobalt Comet . . . . .	2,432.65	1,426.13
Lumsden. . . . .	1,814.40	1,079.00
Beaver. . . . .	1,837.00	1,138.94
	7,046,599.83	\$4,168,799.62

## GOLD PRODUCTION OF CANADA.

"United Empire," the journal of the Royal Colonial Institute published in England, included the following paragraph, under the subhead "Canada," in its

"Round the Empire: Monthly Notes," in September number:

"Geological Congress—The twelfth International Congress is to be held this year in Canada, and special care is being taken to ensure that all branches of mining shall be represented. The advance in the value of industrial metals is remarkable. The gold output, which until recently overshadowed other forms of mining, is steadily declining. On the other hand, the value of copper, tin and wolfram has become notably high, while the rarer minerals are also coming to the front, so that the prospector of to-day has new possibilities to take into account."

It may be that the foregoing comments on industrial metals were intended to be general, but if they are supposed to be applicable to Canada only, then the writer is astray in some of his alleged facts. Tin and wolfram have no place in recently published Dominion mineral production tables. The value of the 1912 production of copper was certainly high—the highest yearly total on record. The statement as to gold is not correct as regards Canada's production of that metal during seven years, 1906-1912, as will be seen by examination of the following comparative table, compiled from statistics published by the Mines Branch of the Canada Department of Mines, although it is admitted that for the previous seven-year period, 1899-1905, the total was much larger. In order to show the chief sources of the gold production of Canada, that of Yukon and British Columbia appears separately:

Year.	From all			Total.
	From Yukon.	From Brit. Columbia	of Dominion other parts	
1906..	\$5,600,000	\$5,579,039	\$ 323,081	\$11,502,120
1907..	3,150,000	4,883,020	349,760	8,382,780
1908..	3,600,000	5,929,880	312,225	9,842,105
1909..	3,960,000	5,174,579	247,651	9,382,230
1910..	4,570,362	5,403,318	232,155	10,205,835
1911..	4,634,574	4,930,145	216,358	9,781,077
1912..	5,540,000	5,167,390	1,852,053	12,559,443

It is true there was a steady decrease in total value of the gold production of the Dominion as a whole from its maximum yearly output of \$27,908,153 in 1900 to \$8,382,780 in 1907, but far from the production, since the latter year, having "steadily declined," it will be seen that as compared with 1907 the estimated production of 1912 shows an increase of approximately 50 per cent., while there is good reason to expect that the revised figures for the latter year, when they shall be available, will make an even somewhat better showing. Further, having in mind that Yukon, British Columbia and Ontario have each produced more gold during the expired portion of 1913 than for the corresponding portion of 1912, there is ample warrant for expecting an appreciably large increase in 1913 over 1912 and, of course, a higher percentage of increase over 1907.

Should it be contended that "United Empire" referred to production of a larger field than Canada, the figures above quoted may not be used as evidence that that publication is in error. However, this good purpose will be served—they will show that Canada's production of gold was larger in 1912 than in any other year since 1905. It may be added that the great decrease from the maximum above shown was chiefly in the production of Yukon Territory—from its maximum of \$22,275,000 in 1900 to \$3,150,000 in 1907.

## STOCK QUOTATIONS.

(Courtesy of J. P. Bickell & Co., Standard Bank Bldg.,  
Toronto, Ont.) Oct. 14, 1913.

## New York Curb.

	Bid.	Ask.
American Marconi .....	4.75	5.00
Alaska Gold .....	21.50	21.62½
British Copper .....	2.50	2.62½
Braden Copper .....	7.00	7.12½
California Oil .....	....	....
Chino Copper .....	38.75	38.87½
Giroux Copper .....	1.12½	1.50
Green Can. ....	30.00	34.00
Granby. ....	70.00	70.50
Miami Copper .....	22.00	22.12½
Nevada Copper .....	14.87½	15.00
Ohio Oil .....	130.00	132.00
Ray Cons. Copper .....	18.75	18.87½
Standard Oil of N. Y. ....	149.00	151.00
Standard Oil of N. J. ....	375.00	377.00
Standard Oil (old) .....	1145.00	....
Standard Oil (subs.) .....	....	....
Tonopah Mining .....	4.62½	4.75
Tonopah Belmont .....	7.00	7.25
Tonopah Merger .....	.59	.60
Inspiration Copper .....	15.00	15.50
Goldfield Cons. ....	1.37½	1.43
Yukon Gold .....	2.00	2.25

## Porcupine Stocks.

	Bid.	Ask.
Apex. ....	.00½	.01
Dome Extension .....	.06½	.07½
Dome Lake .....	.15	.16
Dome Mines .....	10.00	10.25
Eldorado. ....	....	.01
Foley O'Brien .....	.19	.22
Hollinger. ....	17.10	17.20
Jupiter. ....	.08	.09
McIntyre. ....	2.00	2.10
Moneta. ....	.02	.04
North Dome .....	....	.25
Northern Exploration .....	.50	1.00
Pearl Lake .....	.12½	.13
Plenaurnum. ....	....	.75
Porcupine Gold .....	.07	.08
Imperial. ....	.01½	.02
Porcupine Reserve .....	....	.06
Preston East Dome .....	.01½	.02
Rea. ....	.10	.20
Standard. ....	....	.01
Swastika. ....	.02	.03
United. ....	....	.01
West Dome .....	.08	.10

## Cobalt Stocks.

	Bid.	Ask.
Bailey. ....	.07	.07¼
Beaver. ....	.27½	.28½
Buffalo. ....	2.00	2.20
Canadian. ....	....	.22
Chambers Ferland .....	.13	.14
City of Cobalt .....	.25	.35
Cobalt Lake .....	.45	.50
Coniagas. ....	7.50	7.75
Crown Reserve .....	1.57	1.60
Foster. ....	.04	.05
Gifford. ....	.01½	.02
Gould. ....	.02	.03
Great Northern .....	.12	.12¼
Hargraves. ....	.02	.02¼
Hudson Bay .....	70.00	72.00

Kerr Lake .....	3.90	3.95
La Rose .....	1.94	1.97
McKinley. ....	1.42	1.45
Nipissing. ....	8.30	8.50
Peterson Lake .....	.26½	.27
Right of Way .....	.04	.05
Rocheater. ....	-.02½	.03
Leaf. ....	.02	.02½
Cochrane. ....	.30	.50
Silver Queen .....	.03	.05
Timiskaming. ....	.17	.18
Trethewey. ....	.27	.30
Wettlaufer. ....	.06	.09
Seneca Superior .....	2.50	3.00
Porcupine Crown .....	1.30	1.34
Teck Hughes .....	.29	.30

## TORONTO MARKETS.

Oct. 13.—(Quotations from Canada Metal Co., Toronto).

Spelter, 5 cents per pound.

Lead, 5.75 cents per pound.

Tin, 43 cents per pound.

Antimony, 9 cents per pound.

Copper, casting, 17½ cents per pound.

Electrolytic, 17½ cents per pound.

Ingot brass, 11 to 15 cents per pound.

Oct. 13.—Pig Iron—(Quotations from Drummond, McCall &amp; Co., Toronto).

Summerlee No. 1, \$26.00 (f.o.b. Toronto).

Summerlee No. 2, \$25.00 (f.o.b. Toronto)

Oct. 13.—(Quotations from Elias Rogers Co., Ltd., Toronto).

Coal, anthracite, \$8.00 per ton.

Coal, bituminous, lump, \$5.25 per ton.

## GENERAL MARKETS.

Oct. 10.—Connellsville Coke (f.o.b. ovens).

Furnace coke, prompt, \$2.15 to \$2.25 per ton.

Foundry coke, prompt, \$2.75 to \$3.00 per ton.

Oct. 10.—Tin, straits, 40.30 cents.

Copper, Prime Lake, 16.50 to 16.75 cents.

Electrolytic Copper, 16.25 to 16.37½ cents.

Copper wire, 17.25 to 17.50 cents.

Lead, 4.50 cents.

Spelter, 5.40 to 5.50 cents.

Sheet zinc, (f.o.b. smelter) 7.75 cents.

Antimony, Cookson's, 7.50 to 7.60 cents.

Aluminum, 20.00 to 21.00 cents.

Nickel, 40.00 to 45.00 cents.

Platinum, ordinary, \$44.50 to \$45.00 per ounce.

Platinum, hard, \$50.00 to \$51.00 per ounce.

Bismuth, \$1.95 to \$2.15 per pound.

Quicksilver, \$39.00 per 75-lb. flask.

## SILVER PRICES.

	New York.	London.
	cents.	pence.
Sept. 25. ....	61½	28¼
" 26. ....	61½	28½
" 27. ....	61½	28½
" 29. ....	61¾	28½
" 30. ....	61¼	28½
Oct. 1. ....	61½	28½
" 2. ....	61½	28½
" 3. ....	61½	28½
" 4. ....	61½	28½
" 6. ....	61	28½
" 7. ....	61¼	28¼
" 8. ....	60¾	28½
" 9. ....	60¾	28½
" 10. ....	60¾	28½