

THE CANADIAN MINING JOURNAL

VOL. XXXV.

TORONTO, March 15, 1914.

No. 6

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

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."

CONTENTS.

Editorial—	Page
The Iron Industry	181
Economic Minerals and Mining Industries of Canada..	182
Mineral Production of Canada in the year 1913.....	182
Concentration and Cyanidation of Cobalt Silver Ores..	182
First Aid Trophy	183
Canadian Mining Institute, Annual Meeting, 1914	184
Canadian Mining Institute, Western Branch	187
Canadian Mining Institute, Rocky Mountains Branch	188
Mineral Production of Canada in the Year 1913, by J. McLeish.	189
Mineral Production of Ontario in the Year 1913, by T. W. Gibson.	196
Kirkland Lake Flotations, by T. A. Richard	199
Gas and Oil Fields of New Brunswick, by Mathew Lodge..	200
Manganese-Steel Rails, by Sir Robert Hadfield	204
The Mill and Metallurgical Practice of the Nipissing Mining Company, Cobalt, by James Johnston	205
Personal and General	211
Special Correspondence	212
Markets.	216

THE IRON INDUSTRY

While great progress is being made in mining many metals in Canada the iron industry lags behind. The reason is undoubtedly that most of the iron deposits thus far discovered are not of a character to permit of profitable mining.

Iron smelters find it economical to import iron ores from other countries rather than to use Canadian ores. They would rather use Canadian ores if a good supply were available. Unfortunately the known deposits of good ore in Canada are few. It is very well known that there are many occurrences of iron ore in Canada, and that some of the deposits are large. The large deposits are, however, not of high grade and cannot be mined and smelted in competition with ores from outside. There are in Canada many extensive areas of "iron formations." It is not unlikely that good ore bodies occur in parts of these iron formations. The locating of them has, however, not yet been successful.

According to Mr. McLeish, of the Department of Mines, the iron ore shipments from Canadian mines in 1913 amounted to 307,634 tons, valued at \$629,843. This is a very small amount as compared with the iron used in Canada. Imports of iron ore during the year amounted to 1,942,325 tons, valued at \$3,877,824. Imports of pig iron amounted to 253,843 tons, valued at \$3,234,877. There was also imported 926 tons of charcoal pig iron, valued at \$12,528; and 30,355 tons ferro-manganese, ferro-silicon, etc., valued at \$940,443.

The situation is not a new one. It has long been recognized as a painfully distressing one. An effort is now being made to relieve it by obtaining Government assistance in carrying on the industry. At Ottawa last week a proposal was made that a bounty should be given to the producers of iron ore. The amount asked for is about 50 cents per ton of ore produced and smelted in Canada.

That such a bounty would give a great impetus to the iron mining industry is beyond doubt. Many deposits now idle could be profitably worked. A large number of men would be given employment at mines, railways and smelters. The development of the present known deposits would doubtless lead to the discovery of others. Exploration for iron ores would be carried on with great enthusiasm and possibly result in the discovery of much better ore bodies. The bounty would not only aid those who are ready to mine known ore bodies, but would result in a very thorough search for iron ore throughout the country.

ECONOMIC MINERALS AND MINING INDUSTRIES IN CANADA

One of the most useful publications issued by the Mines Branch is the bulletin bearing the above title. It was compiled under the direction of Mr. J. McLeish, Chief of the Division of Mineral Resources and Statistics, who has had the co-operation of several officers of the Mines Branch staff; more particularly Messrs. C. T. Cartwright, L. H. Cole, H. Frechette, H. S. deSchmid, and A. W. G. Wilson; and the objective has been to present in a popular form a brief sketch of the more important economic minerals, and of the mining and metallurgical industries of Canada.

We have found much valuable information in this bulletin and have in recent issues published several short extracts concerning many minerals mined in Canada. We desire to give credit to the staff of the Mines Branch for these concise statements and to recommend our readers to apply to the Director of the Mines Branch for a copy of the bulletin.

MINERAL PRODUCTION OF CANADA IN THE YEAR 1913

In this issue we publish extracts from the preliminary reports for 1913 of the Department of Mines, Canada and the Bureau of Mines, Ontario. In our January 15 issue we published a report by Mr. E. Jacobs on mining in British Columbia during 1913, and a report by Mr. Theo. Denis on mining in Quebec. These reports all show that mining in Canada is a very important industry and that the industry is growing. The preliminary reports of Mr. J. McLeish for the Department of Mines, Canada, Mr. T. W. Gibson for the Bureau of Mines, Ontario, Mr. Theo. C. Denis for the Department of Mines, Quebec, were read at the recent meeting of the Canadian Mining Institute. The preliminary report of Mr. W. F. Robertson, for the Department of Mines of British Columbia was published several weeks ago. Copies can be obtained on application to the several departments.

CONCENTRATION AND CYANIDATION OF COBALT SILVER ORES

At the recent meeting of the Canadian Mining Institute two papers presented by Mr. James Johnston, of the Nipissing Mining Company, and Mr. Fraser Reid, of the Coniagas Company, showed that there is considerable room for discussion as to the best method of recovering the silver from low grade Cobalt silver ores. Mr. Johnston showed that excellent results are being obtained by cyanidation at the Nipissing plant. Mr. Reid showed that equally good results are being obtained by straight concentration at the Coniagas plant.

Mr. Johnston's paper has been published in bulletins

of the Canadian Mining Institute and the American Institute of Mining Engineers. The description of the Nipissing cyanide plant was published in our February 1st issue, and part of this paper is published in this issue. The paper is an excellent description of the plant and methods. The basis for comparison of concentration and cyanide methods is, however, not clear. Mr. Johnston presents figures comparing a concentration mill giving an 80 per cent. extraction and costing \$160,000 with a cyanide plant giving a 90 per cent. extraction and costing \$250,000. He concludes that on ore assaying 30.99 oz. per ton the cyanide plant yields 28.88 oz. silver at a profit of \$12.09 and the concentration plant 25.67 oz. at a profit of \$10.50 per ton.

These estimates, so far as the cyanide plant is concerned, have been found well within the mark, the results obtained being a 92 to 93 per cent. extraction on a 26 oz. ore at a cost of less than \$3.00 per ton, a plant costing \$254,839.52, treating 244 tons per day.

On the other hand, however, there has been no similar check on the estimates regarding the concentration plant. Mr. Reid's paper will show that actual results obtained are better than the estimate. The operation of the Coniagas, Northern Customs and other mills using straight concentration methods has been brought to a high degree of perfection.

Early attempts to use cyanide methods were made by the Buffalo, O'Brien and Nova Scotia mining companies. These were regarded as only fairly successful. At the Buffalo only slimes were treated. At the Nova Scotia a combined amalgamation and cyanidation method was used.

It was at the O'Brien plant that aluminum was first used at Cobalt for precipitating silver. In 1906 S. F. Kirkpatrick, Professor of Metallurgy, School of Mining, Kingston, undertook some experiments, with the assistance of the Ontario Bureau of Mines, on the ores of the Cobalt district in order to develop a commercial process of treating them and saving the by-products. It was found that the ores were fairly amenable to cyanidation even when they contained 2,000 to 4,000 oz. silver per ton; but the cyanide consumption was heavy, and zinc was not an ideal precipitant, tending to foul the solution and give a bullion below market requirements. Mr. Kirkpatrick found that aluminum could be used satisfactorily, the difficulties experienced by earlier experimenters being overcome by using the metal in the form of a dust. The process was introduced by the Deloro Mining & Reduction Co., in 1908, and has been in use ever since.

In the Nipissing plant, described by Mr. Johnston, this feature of the O'Brien plant has been adopted. A distinctly new feature is the desulphurizing process devised by Mr. J. S. Denny. These two features, the aluminum dust precipitation and the desulphurizing by aluminum, are important factors in the cyanide process at Cobalt.

FIRST AID TROPHY

Those who are interested in First Aid work will be pleased to learn that the Honorable Louis Coderre, Minister of Mines, has presented to the St. John's Ambulance Association a trophy for annual competition among the mine workers of Canada.

Some time ago the Honorable Wallace Nesbitt gave a trophy for competition amongst railway employes; one for general competition in Canada and one for the cadets in each Province. These trophies have been the means of encouraging First Aid work. The trophy given by Mr. Coderre is for mining men only, and will be the means of stimulating First Aid work in connection with mines.

As was pointed out by Mr. W. J. Dick at the recent meeting of the Canadian Mining Institute, in Montreal, it is more important for miners to take a course in First Aid than for employes in other industrial work. In case of an accident on the surface it is generally only a matter of a few moments before a surgeon and ambulance are in attendance; but in case of accidents which happen underground it may be anywhere from half an hour to four or five hours before the assistance of a surgeon can be obtained or the man brought out of the mine. At some of our coal mines in the West it would take two or two and a half hours' fast walking to go from the face of the workings to the foot of the shaft. First Aid to be of any importance should be rendered immediately, and the natural one to administer First Aid is the person with whom the injured one is at work at the time of the accident.

Canadian mining men are learning that Mr. Coderre is taking a very sincere interest in the work of the Department of Mines. Those who traveled with him on the Western excursions of the Geological Congress are well aware of this. The evidence of interest in First Aid work, which the donation of this trophy shows, will be well received. Mr. Coderre deserves the hearty thanks of those who are trying to improve the conditions under which miners work.

GRANBY.

Vancouver, March 9.

It is expected that the new 2,000 ton smelter of the Granby Mining Co., at Granby Bay, will be blown in shortly. This smelter was to have commenced operations last week, but the dam broke, necessitating some repairs. The blowing in of this smelter will mean greater activity among the copper districts in the north. The Granby Co. alone has 2,000,000 tons of low grade ore already blocked out on its Hidden Creek property.

COPPER REPORT.

New York, March 9.

The statement of the Copper Producers' Association for February shows a decrease in stock on hand of 8,924,833 lb., compared with the previous month.

YUKON GOLD.

The Yukon Gold Company produced \$4,789,402 gross gold in 1913 and the net profits were \$1,453,536. The output and dividends compare as follows for the past five years:

	Production.	Dividends.
1909	\$1,747,599	\$700,000
1910	2,847,098	1,400,000
1911	3,106,227	1,312,500
1912	4,975,069	1,050,000
1913	4,789,402	1,050,000

TOUGH-OAKES.

London, March 11.

The Tough-Oakes Gold Mines, Ltd., offers 100,000 shares at par. The Financial News, in referring to this issue, says insufficient work has been done on the property to justify the capitalization of £500,000, and calls the shares a pure speculation. The Financial Times says they are very much of a gamble.

TIMISKAMING.

Toronto, March 11.

Counting of the votes in the Timiskaming shareholders' election was concluded last night, the final report being more favorable to the Wills ticket than was expected earlier in the day, the majority for the ticket being in the neighborhood of 700,000 shares. About 18,000,000 shares voted, a bigger response to the ten day campaign than resulted in the campaign two years ago, which ran for sixty days.

ASBESTOS CORPORATION OF CANADA.

The annual statement of the Asbestos Corporation of Canada, Limited, made public this week was rather disappointing. On the large capitalization of \$4,000,000 preferred stock and \$3,000,000 common, surplus earning for the year amounted to only \$54,765, or equivalent to about 1.3 per cent. on the preferred shares.

Progress has been made in the past few years. Against a loss on operation of \$64,614 in 1911, when the company was carrying a burden of nearly \$400,000 in interest charges—that is the last year of the company before reorganization—the 1913 statement shows a profit from operation of \$270,932, an amount sufficient to meet bond interest, to allow \$67,416 for renewals and betterments, and to leave \$54,765 to be carried forward to surplus account.

The reports of the president, Mr. W. G. Ross, and the general manager, Mr. J. D. Sharpe, both speak hopefully of the outlook. Mr. Ross states that "the tonnage of asbestos produced showed an increase over the preceding twelve months of 5,400 tons. The demand for asbestos has been exceptionally good and prices have improved. The unfilled orders on hand amount to \$1,278,386." Mr. Sharpe supplements this by stating that "the contracts on hand for delivery during 1914 are sufficient to keep the properties in full operation during the year."

The new company continues to keep itself in a strong position. The balance sheet shows current assets of \$1,075,682 against current liabilities of only \$93,655, an increase of \$50,000 in the former item and a decrease of about \$8,000 in the latter. In current assets are included the large sum of \$524,390 in cash.

—Journal of Commerce.

CANADIAN MINING INSTITUTE ANNUAL MEETING, 1914

The sixteenth annual general meeting of the Canadian Mining Institute was held in Montreal at the Ritz-Carlton hotel on Wednesday, Thursday and Friday, March 4, 5 and 6, 1914. The attendance was smaller than in some former years; but the meeting was as usual a distinctly successful one.

The members were surprised to learn a few weeks before the meeting that a change had been made in location of headquarters. In a bulletin published a few days before the meeting, however, it was explained that such a move was necessary in the interests of the Institute. Many of those who attended the meeting expressed themselves as very well satisfied with the change. The room in which the meetings were held is undoubtedly the best that has yet been available for the purpose. It is large and beautifully decorated. Members were pleased to find that they could smoke during the sessions to their hearts' content without losing sight of one another. The rooms which were assigned to members are also very attractive. The absence of a large rotunda caused some unfavorable comment.

Business Meeting.

On Wednesday morning a business meeting was held. The presidential address was delivered by Dr. Barlow. Reports of officers were presented and the officers for the ensuing year were elected.

Statistical reports issued by the Dominion Mines Branch, the Ontario Bureau of Mines and the Quebec Mines Branch were presented by J. McLeish, chief of the Division of Mineral Resources and Statistics, Mines Branch; T. W. Gibson, Deputy Minister of Mines, Ontario, and by J. A. Bancroft, on behalf of Theo. Denis, Superintendent of Mines, Quebec. These reports are published in this issue of the Journal.

Dr. Barlow, in his presidential address, referred to the progress of the Institute, pointing out that at the end of the year the membership was 1,029, there being 113 new members. There were eight branches of the Institute, and during his regime two new branches had been formed, the Rocky Mountains and the Ottawa branches, the former being now the biggest with the exception of the Western branch. He gave a mede of praise to the secretary, Dr. Bancroft, J. E. Hardman and J. M. Gordon, for the excellence of the publication of the proceedings, and then referred to the fact that on the recommendation from the Institute it was expected that the Federal Mines Act and Explosives' Act would be introduced and passed by the Dominion House this session.

Touching on the question of the mineral resources of Canada, the president said that legislators were fond of dealing in generalities as to the vast resources of Canada. No nation could be truly great unless it had an abundant supply of minerals, coal and iron. Canada had plenty of coal, but her iron resources gave considerable anxiety. There had been quite a campaign to ask the Government to take some action towards putting a bounty on iron ore produced in Canada so as to stimulate the industry, and, at the same time, considerable exploration should be conducted in the great hinterland which was underlaid by Archean rocks, which gave promise of holding large deposits of iron. Resolutions had been submitted to Boards of Trade, and other public bodies, in which the Government were urged to take such measures and render such assistance to the obtaining and treatment of Can-

adian iron ore as would keep this industry in the Dominion to be developed for the benefit of Canadian people. He emphasized that it would be national suicide to adopt any such measure as an import duty on United States ore, considering that a bounty on Canadian ore would be the best method of increasing the output.

There was some discussion on the advisability of memorializing the Dominion Government to make an enquiry into the condition of the iron industry with a view to doing something to encourage it. At a later meeting Mr. Eugene Coste presented a resolution providing for the naming of a committee of Institute members to draft a memorial to the Dominion Government. This resolution was carried.

Two other resolutions were also proposed and carried. The first conveyed sympathy and condolences to the family of the late Hon. C. R. Devlin, Minister of Colonization, Mines and Fisheries, who had always been a staunch friend of the Institute. The second conveyed the thanks of the Institute to Hon. Louis Coderre for his action in offering a trophy for competition among first-aid teams in connection with the mining industries of the country.

This resolution, proposed by Mr. W. J. Dick, was worded as follows: "The Canadian Mining Institute, having learned that the Honorable Louis Coderre, Minister of Mines, has graciously donated a trophy to the St. John Ambulance Association for annual competition among all mine employees in Canada proficient in first-aid to the injured.

"Therefore, be it resolved that this Institute express its sincere appreciation of this generous gift, believing that it will not only stimulate the efforts put forth to instruct mine officials and miners generally in first-aid work, but at the same time will do much towards lessening suffering and will minimize the loss of efficiency due to mine accidents in Canada."

There was a discussion of proposed amendments to the by-laws, calling for the appointment of a nominating committee. Most of those who spoke showed themselves opposed to any such change. The proposals were not brought formally before the meeting, as Mr. J. M. Gordon, who advocated the changes, was unable to attend.

Technical Sessions.

The first technical session was held on Wednesday afternoon, Mr. A. A. Cole being in the chair. The papers presented were: "The Sampling of Cobalt Ores," by C. St. G. Campbell, Cobalt, Ont.; "Milling Practice at Cobalt," by Fraser D. Reid, superintendent of the Coniagas mill, Cobalt, and "Pyritic Smelting," by Geo. A. Guess, Professor of Metallurgy, Toronto University.

Sampling Cobalt Silver Ore.

Mr. Campbell gave a detailed description of the peculiarities of the Cobalt silver ores in so far as they are important in sampling. He showed that the rich ores are very difficult to sample accurately; but that successful methods have been devised at the sampling plant at Cobalt. He described the method of sampling and presented figures to show the accuracy of the method in use. The Cobalt district is fortunate in having in Cobalt a reliable sampling plant, and the members were pleased to hear the description of it by one of those who has given so much time and study to the perfecting of a reliable method.

Cobalt Milling Methods.

Mr. Fraser Reid, in presenting his paper on milling methods at Cobalt showed that the straight concentration methods have been very successful, and that stamps have been more satisfactory than other crushing devices used. He remarked that the use of cyanide was desirable under certain conditions; but that in some cases a very good recovery is being made without cyaniding, and that the additional cost of cyanide treatment is not in some cases warranted by results.

Mr. James Johnston was not present to present his paper on "Mill and Metallurgical Practice of the Nipissing Mining Company," and as none of those present championed the cyanide method, there was no discussion.

Pyritic Smelting.

Mr. G. A. Guess presented a brief summary of his paper on "Pyritic Smelting." He called attention to some of the peculiarities of the process and to some of the advantages to be gained where it can be successfully applied. Dr. Peters made a few general comments on pyritic smelting.

Development of Reverberatory Furnace.

Dr. Edward D. Peters did not present a formal paper, but asked to be allowed to talk informally about the development of the reverberatory furnace and to later submit a more formal written discussion. The result was that the members had the privilege of listening to a very interesting historical account of the development of the furnace. Dr. Peters' experience goes back so far, and his study has been so thorough, that his mastery of his subject was clearly apparent.

In speaking of the reverberatory type of furnace, Dr. Peters emphasized the fact that it had its origin in Swansea, where, with an abundance of coal at hand for fuel, the reverberatory furnace had always held its own, while the Continental brethren had always stuck to the blast furnaces. He explained the construction of the reverberatory furnace, the faults which had been found in the earlier types, and the experiments which had resulted in the production of the present furnace 112 ft. in length, in which the ore is melted almost immediately it is thrown into the furnace, and the slag is drawn off without the loss of much heat.

Excursion Through Mount Royal Tunnel.

Thursday morning was spent in the Mount Royal tunnel, which is being constructed by the Canadian Northern Railway. The tunnel, a description of which was given in our Feb. 15 issue, is three miles long.

The members were divided into two parties. The first comprised those enthusiastic members who had made up their minds to walk through the first two miles of the tunnel—suitably attired in old clothes and rubber boots, and fearless of the eight or ten inches of water that they were warned beforehand would be encountered during the journey. The other party assembled an hour later and entered the tunnel by a shaft and made the trip to the western portals in trains drawn by electric locomotives.

The excursionists were conducted by S. P. Brown, chief engineer of the Canadian Northern Montreal Tunnel and Terminal Co., Ltd., and Dr. J. Austen Bancroft, professor of geology at McGill University.

Description of Methods of Excavation.

At the Thursday afternoon session Mr. Brown gave a well illustrated description of the methods of excavation in the Mount Royal tunnel. The methods of removing the broken rock quickly are especially interesting. The drill carriages proved quite successful.

Mr. Brown in opening pointed out that while, historically, tunneling antedated mining, it was most often employed as an operation in mining. Tunneling, however, as commonly understood, differed from ordinary mining in that it usually consisted in driving a subterranean gallery, of definitely determined proportions, in a determined direction, without regard to mineral conditions encountered. The conditions of operation were therefore somewhat different, and often unsuited, to those usually adopted in mining work.

Another consideration is that while mining excavation normally pays the cost of operation, a tunnel is unproductive until it is completed, and thus the costs are cumulative. Time therefore became a prime consideration, as every million spent in costs represented an addition of 5 or 6 percent. in interest charges without return, while if other works, such as lines of railways, were awaiting the tunnel completion, the interest account may reach appalling proportions.

Mr. Brown then proceeded to describe and show the various scientific and mechanical means adopted to construct the tunnel in the minimum amount of time and with due regard to economy of construction. As indicating the close calculation possible, he mentioned that in an address at Toronto early in November he had said that the two ends of the tunnel were expected to meet by December 10th. The actual meeting occurred at 7 o'clock on the morning of December 10th.

Photographs of Cobalt Silver Veins.

Following Mr. Brown, Mr. A. A. Cole, of Cobalt, presented a number of slides showing with remarkable clearness some characteristic mineral and geological formations in the Cobalt district, including some of the famous veins from which millions of dollars in silver had been taken at various mines. The retiring president, Dr. Barlow, who occupied the chair, pointed out that Mr. Cole had been so successful with this class of photography that his pictures were now used by professors and lecturers in many leading schools of mining. Mr. Cole also showed some unique photographs which depicted graphically at half-hour periods the rapid spread of a forest fire.

A valuable paper on "Factors Influencing the Cost of Power" was contributed by Mr. J. McNeil Forbes, of Montreal.

Scientific Management.

This was followed by a series of slides illustrating the Taylor methods of scientific management. The lecturer, Mr. F. B. Gilbreth, of New York, explained that the devices shown were designed to measure efficiency and skill of operatives in various industries. The nine laws which governed modern scientific management of factories were summarized as follows: A task for every employee, standardization of methods of production, bigger pay for successful workers, smaller pay for unsuccessful workers, substitution of expert for non-expert workers, reducing the industry concerned to an exact science, hearty co-operation of all grades, and even division between managers and workers of responsibility for maintaining standardized conditions. Mr. Gilbreth then showed the ingenious devices perfected after years of experimentation, for

measuring the speed, the time, the direction and the relative dimensions of length, breadth and depth of the manual motions of workers. A point upon which he laid special stress was the elimination of unnecessary fatigue in the interests of the workers. Any unnecessary fatigue to which a worker was subject was not only a social crime toward the worker, but also a disadvantage to the employer, as lowering the employee's efficiency.

The Smoker.

Thursday evening a smoker was held in the ball-room. Chairman Col. Penhale conducted matters in his usual happy and successful manner, although his assumption of office and title was challenged by the president-elect.

Col. Penhale declared that he was Dean, and that the assemblage was a special convocation for the conferring of degrees on prominent members. Mr. Lindsey, in accepting a degree for one of the absent members, demanded first to know who in "convocation" Col. Penhale was, and how he got his robes of office. He referred to him as vice-chancellor; but the Colonel refused to be in any way associated with vice.

The victims of the convocation, and the degrees conferred, included: John Hardman, of Montreal, K.B.J.G.F. (Knocker but Jolly Good Fellow); Mr. Haultain (in absentia), G.A.G. (Grand Assaulter of Geologists); Dr. Bancroft, of McGill, G.S.B. (Grand Stone Buster); Eugene Coste, V.S. (Volcanic Secretionist); J. B. Tyrrell, of Toronto, A.R.O.C. (Artistic Romancer of Canada); and Dr. Barlow, of Montreal, R.I.P. (Rather Interesting President). The degrees were accompanied by inscribed addresses, in which the idiosyncrasies of the recipients were hit off most effectively. This was followed by a ludicrous burlesque on the discovery of the North Pole, in which various members of the Institute were mercilessly caricatured, and this again by a humorous illustrated narrative by Dr. Adams of an exploring expedition, in which many members took part.

On Friday morning several papers were presented. Mr. H. M. Payne, of New York, talked on "Efficiency Engineering Applied to Mining Quarries and Industrial Plants." Mr. W. McAlpine Johnson described a promising electric process for the treatment of zinc ores. Mr. A. Stansfield talked on "Recent Metallurgical Improvement," and Mr. H. Du Bois presented his paper on "High Carbon Steel Plates for Sluiceway Linings."

Efficiency Engineering.

Mr. H. M. Payne's ideas of the best way of improving methods are apparently quite different to those of Mr. Gilbreth.

"The best type of efficiency is common sense, taken frequently and in large doses. Inefficiency is the price of 'yes' and 'no.' Equipment regulates output and creates cost. Co-operation of employees increases output and decreases cost." These were the four epigrams which he called to the attention of members.

"I wish there were no such words in the English language as 'efficiency engineering,' or 'scientific management,'" he declared. "They have become so detested with most of us because, to the average man, they stand for red tape, increased clerical labor and routine. I am ready to grant that efficiency engineering can be applied with refinements of cruelty to stop watches; but the efficiency engineering I propose is to eliminate red tape, to make a man's work human instead of inhuman, to remember that pleasure in his

work, is after all, the most important factor, and to eliminate, as far as possible, turning him into a human machine.

"You can buy a man's time and skill, but you cannot buy his co-operation. I agree that, in certain types of high grade skilled labor, it is possible to make motion studies to advantage, but my idea of efficiency engineering is not a colorless standardization, but rather an emphasized individuality. There is nothing mysterious or wonderful about efficiency engineering; it is nothing but plain, good horse-sense applied by a man who comes in from the outside and studies your problems free from the circular line of reasoning you are in, and free from the limitations of tradition that you are bound by."

The Johnson Electric Furnace.

Mr. W. McAlpine Johnson stated that he has produced an electric furnace which will allow of the treatment of the complex zinc ores similar to those of British Columbia on a commercial basis. This, if it is borne out by further exhaustive experiments on a larger scale will be a matter of great importance to the mining industry, and will allow of the extraction of the baser from the precious metals. The Government Department of Mines has been experimenting with other processes for years in order to make zinc smelting a profitable undertaking, but without any definite success. Mr. Johnson claims that he can produce more spelter by the use of less power than is found necessary in other countries, despite the fact that the ores in Canada are not of such a high grade as those of Norway and Sweden.

The president said if the problem had been solved the Dominion would be saved a lot of money and he thought a serious attempt should be made to take an inventory of the country's zinc resources, as well as iron.

Mr. W. R. Ingalls, who has been working for the Mines Department on the zinc question in Canada, said their warmest congratulations were extended to Mr. Johnson on the success of his experiments. At the present time he stood ahead of anybody in North America in his accomplishments. Serious experimental work had been carried on in Europe since 1898, and in Sweden and Norway electric zinc smelting was a process that was in operation, but they produced such an excessively large quantity of between products, and the inevitable expense attached to the resmelting of such products was so great that it was not a commercial success, although the electric energy required was extraordinarily cheap.

Prof. Stansfield also congratulated Mr. Johnson on his success, but had hoped that the power would have been reduced to 700 k. w. hours per ton of ore, instead of the 1,000 k. w. hours per ton he had mentioned as the quantity of electrical energy consumed.

Mr. Johnson said with a large furnace and better methods of handling, they would be able to get down to 700 k. w. hours per ton of ore.

Mr. Stansfield said if that was so the hope of making zinc smelting a commercial success was not ill-founded.

Recent Metallurgical Improvements.

Prof. A. Stansfield, Montreal, gave a resume of recent metallurgical improvements. He covered the most important advances in practice during the past 14 years, and showed the extent to which the mining profession was commercially dependent on the metallurgist. The metallurgical industry in Canada had

shown a wonderful development during this time, and there was great need for young men trained in Canadian universities to fill important positions, many of which are now filled by men from across the line. He also suggested that the Institute should follow the example of America and Britain and be renamed the Canadian Institute of Mining and Metallurgy.

Sluiceway Linings.

Mr. Howard W. DuBois, Philadelphia, Pa., gave a history of the use of high carbon steel plates for sluiceway linings in hydraulic mining, which, he said, had overcome the expense of heavy wear, and so decreased the cost of the sluiceway and increased the output by 25 per cent. by its smooth surface.

Diamond Mines of Kimberley.

Friday afternoon Mr. Gardner F. Williams gave a very interesting description of the Kimberley diamond fields and of the people. Mr. Williams has for many years been engaged in the industry and presented a well illustrated account of its development. He showed a very large collection of lantern slides and recounted many interesting experiences. He showed how the deposits were first worked, and how improvements were made as time went on. He called attention to the fact that all the diamonds come from the close proximity of the "pipes," which are supposedly of volcanic origin. He showed many specimens which suggest that the diamonds were originally in a crystalline rock, which has been decomposed.

A number of other papers were to be presented, but owing to lack of time only brief summaries were given, and several were not presented at all.

The Annual Dinner.

On Friday evening the members assembled in the ballroom of the Ritz-Carlton hotel for the annual dinner. Among the guests were Col. Sam Hughes, the Minister of Militia, and the Hon. Martin Burrell, Minister of Agriculture; Senator Bostock; Bradley Stoughton, secretary of the American Institute of Mining Engineers; Mr. White, secretary of the Conservation Commission, and Gardner F. Williams. Hon. Louis Coderre, Minister of Mines, was absent on account of illness. Colonel Penhale was toastmaster.

Col. Sam Hughes told the company he was there simply to renew his acquaintance with "the boys."

He spoke of the importance of the mining industry to the country, placing it next in importance to that of agriculture. Canada was a great and wonderful country to develop, and after visiting the northern regions he believed that Canada could not do better than send some of her best mining engineers into those remote areas to carry out prospecting work. No company could be expected to carry out real development in those regions under the existing conditions, and he would use his best endeavors to carry out the wishes of the Institute in any way he could to improve the industry.

The Minister of Agriculture drew a simile between mining and agriculture, and emphasized the need of continued progress being made in the science of geology to get the best results from the earth's treasures. The prosperity of the country must largely depend on agriculture, and he said that, unless that was put on a profitable basis, it would upset all the rest of the economic structure of the country. There was no other industry in Canada which had developed so greatly as the mining industry with so little State aid, and by the help largely of individual enterprise and intelligence. Its advance has been phenomenal, but

it was only a small portion of what might be done in the future.

The retiring president expressed gratification that the Institute continued to grow in numbers and usefulness, and announced his conviction that, under the new president, the Institute would rise to greater heights of utility.

Senator Bostock said they were looking forward to a great revival in mining in the near future. They were suffering in British Columbia from speculations and it was hoped that every man interested in the mining industry would do all he could to prevent speculation in the development of that industry.

The president-elect, G. G. S. Lindsey, spoke on the welfare of the Institute, outlining as his policy during the coming year, the determination to enlist the support and co-operation of the mining and geological experts of Nova Scotia, and enlist them in the Institute. Their absence from membership was the one rift in the lute. He thanked Mr. Coderre for all that he had done for them as Minister of Mines, and added that they had great hopes for the future.

Among the interesting things said was the suggestion of Col. Penhale that the mantle of Minister of Mines could not fall on better shoulders than those of the Hon. George R. Smith, who is in the Legislative Council of Quebec, and whose appointment would give the greatest satisfaction to the mining interest in the Province, an expression of opinion that was enthusiastically endorsed.

The official part of the programme having been completed, the members at midnight adjourned to a smaller room and continued the evening's entertainment by impromptu speeches and stories. After a few hours everyone seemed to be satisfied, and the informal meeting came to an end.

CANADIAN MINING INSTITUTE—WESTERN BRANCH.

The following report of the Seventeenth General Meeting of the Western Branch of the Canadian Mining Institute, held in Vancouver, British Columbia, on February 19, has been taken from the Vancouver Daily News-Advertiser:

The question of the "wild-cat" was the first theme touched upon at the meeting yesterday in the Board of Trade rooms of the Western Branch of the Canadian Mining Institute. Mayor Baxter gave the lead to the consideration of it in his address of welcome and Mr. Jonathan Rogers, vice-president of the Vancouver Board of Trade, who extended a welcome on behalf of the Board, called attention not only to the "wild-cat" for which British Columbians might primarily be responsible, but for the overloading in London of a really good proposition until it too became as bad as a "wild-cat." He thought the time would come when there would have to be an exposure of the extortion of those in London who came between the man with the good proposition and the buyer.

The chairman agreed that more harm was done to mining in that way than by the "wild-cat," which in itself had no intrinsic value. Mr. W. Fleet Robertson, Provincial Mineralogist, described the "wild-cat" as a difficult one to tackle. He had very vivid recollections of two or three mines which had had long and honorable careers being at their inception regarded as "wild-cats."

Mineral Production in 1913.

The chairman, Mr. W. J. Sutton, quoted from the estimates of the Provincial Mineralogist to show that

the value of the mineral production in 1913 was a little more than \$30,000,000; that the aggregate mineral production of the Province had reached the grand total of \$460,000,000, and that more than 50 per cent. of that total had been produced in the last eight years.

The industry could be regarded as having made very satisfactory progress during what was considered by many as a very baneful year and, although the production was a little more than \$2,000,000 less than in 1912, it was greater than in any previous year. There had been a decrease in the production of coal and copper, but an increase in the production of gold, silver, lead, zinc and coke.

The year's mining in each of the districts of the Province was reviewed and increased development work in practically every district noted.

Higher extraction of metals contained in the ores and low costs per ton of ore treated marked the year's work at the smelting works and the larger stamp mills operated in the Province. In Boundary district copper mines much ore that it was not possible to mine with profit some years ago had been shipped to the reduction works. There had been a substantial increase in the dividends paid by the metalliferous mines. The total of distributed profits of \$2,390,000 was nearly double that paid in 1912.

Railway developments would greatly increase the mineral production of the Province, and the encouragement to prospecting in remote areas by the building of roads and trails was also noted.

Mr. W. Fleet Robertson stated that so far as he had been able to correct his estimate, placer gold would be 2 per cent. higher than stated in his "Preliminary Review"; copper would be two-thirds of one per cent. higher; the coal estimate was pretty nearly exact; coke was three-tenths of one per cent. lower; lode gold would be within one-tenth of one per cent. higher, and zinc would be about ten per cent. lower, because he had to now calculate only the amount shipped before the close of the year, which was less than that produced.

Accidents in B. C. Mines.

In a report on the mine accidents in 1913 by Mr. Thos. Graham, chief inspector of mines, the fatalities in coal mines were put at 27, one less than in 1912. In metalliferous mines the fatalities were 13, an increase of 5 over 1912. In the coal mines the ratio of fatal accidents per 1,000 persons employed was 4.05, compared with 3.93 in 1912; in metalliferous mines it was 3, compared with 2.10 for 1912. The use of non-freezing powders, Mr. Graham believed, would reduce the accidents from drilling into miss-holes in metalliferous mines. He also called attention to the usefulness of pulmotors even in metalliferous mines.

There was one mine inspector for every 1837 mine workers in British Columbia; in Great Britain the number of inspectors worked out at one for every 21,904 persons employed. Not more than 40 per cent. of the accidents was due to causes inherent in the business and unavoidable; 60 per cent. was due to the negligence of workers or lack of maintenance of proper discipline by responsible officials.

First Aid to the Injured.

In the afternoon Dr. Brydone Jack read an interesting address emphasizing the importance of St. John Ambulance Association first-aid training about mines, to which were attached notes by Mr. Thos. McGuckie, formerly general superintendent of the Western Fuel Company's mines, on mines rescue work. The chief mines inspector added the information that there was

now one rescue apparatus for every 60 persons employed in mines in the Province.

Coal Mining in Nova Scotia.

After discussion of methods, there was read a paper by Mr. W. J. Dick, mining engineer to the Commission of Conservation, entitled "Notes on Coal Mining in Nova Scotia." The writer stated, in his introduction, that the paper had been presented for the purpose of giving to the coal operators on the Pacific Coast a brief resume of the outstanding features of coal mining practice in Nova Scotia. The paper was read by Mr. Thos. Graham, and was illustrated by lantern-slide views. After it had been discussed, Mr. Geo. Watkin Evans, of Seattle, gave a brief survey of the Alaskan situation.

Copper Mining on the Coast.

Copper was the subject at the evening session and the discussion on that and on mineral production of British Columbia generally, was studded with figures showing the enormous developments in recent years. The ten years ending 1913 showed an increase in mineral production of more than 100 per cent. The extensive new coast works of the Granby Co. were sketched and the prospects on Queen Charlotte Islands stated.

Granby Co.'s Activities.

In addition to describing the nature and extent of the developments of the Granby Consolidated Co. at Hidden Creek mines, near Granby bay, Mr. E. E. Campbell, one of the engineers of the company, gave interesting information as to the extension of the company's undertakings at other parts of the coast. During the past year and a half several new properties have been acquired, one at Valdes Island, Alaska, which consists of a fairly high grade copper ore. The company has completed its plans for the installation of a plant there and expects to start construction in the course of another month.

The company has also acquired the Mamie mine, on Prince of Wales island, Alaska, and has had men there doing development work and getting it into shape for producing in the spring. The company has also an option on a mine on Texada island, the Copper Queen, owned by the Van Anda Mining Co.

The Granby Co. has also purchased a lime quarry on Portland canal, and this is now in operation.

The company's property at Granby bay is 5,000 acres in extent, and includes a townsite. A complete reduction plant of three blast furnaces, having a capacity of 2,000 tons a day, has been put in.

Tassoo Copper Syndicate.

The first shipment of 500 tons to the smelter at Tacoma can be expected at the beginning of March from the Tassoo property, on Moresby island, of the Queen Charlotte group, which has been acquired by a syndicate, at the head of which is Mr. Robert R. Hedley, who described the property, and gave an account of the progress made to date.

CANADIAN MINING INSTITUTE—ROCKY MOUNTAINS BRANCH.

A meeting of the Rocky Mountains Branch of the Canadian Mining Institute is to be held at Fernie, Crowsnest pass, British Columbia, on March 18 and 19. Mr. W. R. Wilson, general manager for the Crow's Nest Pass Coal Co., Ltd., is chairman, and Mr. John

L. Stirling, Provincial Inspector of mines for Alberta, secretary.

The meeting will be opened in the morning of Wednesday, 18th inst., when the chairman will deliver an address, following which several papers will be read and discussed, as under:

1. "Mine-Rescue Apparatus," by Charles Graham, superintendent for the Corbin Coal and Coke Co., Corbin, B. C.
2. "Mechanical Equipment of Collieries," by N. C. Pitcher, Lethbridge, Alta.
3. "Certain Classes of Faults Encountered in the Crowsnest Pass District, with their Correlative Effects on Economic Mining," by W. R. Wilson.

4. "Shaft Sinking in Edmonton Coal Field," by E. I. Roberts, Evansburgh, Alta.

Papers read at earlier meetings of the branch, namely, those of J. Somerville Quigley, manager for the Hillcrest Coal and Coke Co., Hillcrest, Alta., on "Methods of Driving Pillars in Pitching Seams"; of C. C. Richards, of Edmonton, Alta., on "Field Notes for an Underground Survey"; of M. L. Hyde, on "Important Details in Connection with Construction of Colliery Plants"; of N. C. Pitcher, on "Preliminary Costs of Machinery for Colliery Work"; and of Francis Aspinall, district inspector of mines, Lethbridge, Alta., and Andrew A. Millar, manager for the Pacific Pass Coal Fields, Ltd., Fergie, Alta., on "Mine-Rescue Apparatus and the Value of Mine-Rescue Work," will also be open for discussion.

THE MINERAL PRODUCTION OF CANADA DURING THE YEAR 1913

A preliminary report by John McLeish, published by the Mines Branch, Ottawa.

The preliminary report on mineral production in Canada in 1913 presented herein shows a total value of production in the year just closed of \$144,031,047. Although estimates have been made in some cases where complete returns were not available, it is probable that the final record will be a revision upward. The total value of the production in 1912 was \$135,048,296, compared with which the 1913 output shows an increase of \$8,982,751, or 6.65 per cent. In view of the large increase over all previous years made in mineral production in 1912 and the general trade depression and industrial restriction experienced during the latter part of 1913, the industry would appear to have made in the aggregate very satisfactory progress. The average production per capita in 1913 was \$18.57, as against \$18.27 in 1912 and \$14.93 in 1910.

The production of the more important metals and minerals is shown in the following tabulated statement in which the figures are given for the two years 1912 and 1913 in comparative form, and the increase or decrease in value shown.

Of the total production in 1913 a value of \$66,127,821, or 45.9 per cent. is credited to the metals and \$77,903,226, or 54.1 per cent. to the non-metallic products. The increase over the value for 1912 in metallic products was \$4,955,068, or 8.1 per cent., and in non-metallic products \$4,027,683, or 5.45 per cent.

There was an increased production of each of the metals except copper and silver, the most important increase being in gold with 28 per cent. Pig iron increased 11.3 per cent. in tonnage, lead 5.3 per cent., and nickel 10.8 per cent. The falling off in copper was only 1.1 per cent. in quantity, although 7.6 per cent. in total value, and for silver 0.6 per cent. only in number of oz. and 2.3 per cent. in value, slightly lower average prices having been obtained for these metals.

Amongst non-metallic products increases are shown in all the important products except clays and lime. The largest increase was in natural gas, with 41 per cent. in value. The cement output was greater by 21 per cent. in quantity, asbestos 18 per cent., coal 4 per cent., gypsum 10.5 per cent., salt 6.04 per cent. In the case of petroleum there was a falling off of 6 per cent. in quantity, but on account of higher prices an increase of nearly 18 per cent. in total value.

Production of More Important Metals and Minerals in Canada in 1912 and 1913.

	1912		1913		Increase (*) or decrease (†) in value.
	Quantity.	Value.	Quantity.	Value.	
Copper, lb.	77,832,127	\$12,718,548	76,975,832	\$11,753,440	†\$965,108
Gold, oz.	611,885	12,648,794	784,525	16,216,131	*3,567,337
Pig iron, tons	1,014,587	14,550,999	1,128,967	16,540,012	*1,989,013
Lead, lb.	35,763,476	1,597,554	37,662,703	1,754,705	*157,151
Nickel, lb.	44,841,542	13,452,463	49,676,772	14,903,032	*1,450,569
Silver, oz.	31,955,560	19,440,165	31,750,618	18,984,012	†456,153
Other metallic products		864,343	.....	1,520,072	*655,729
Total		\$75,272,866		\$81,671,404	*\$6,398,538
Less pig iron credited to imported ores, tons	978,232	14,100,113	1,055,459	15,543,583	*1,443,470
Total metallic		\$61,172,753		\$66,127,821	*\$4,955,068
Asbestos and asbestic, tons	136,301	\$3,137,279	161,086	\$3,849,925	*\$712,646
Coal, tons	14,512,829	36,019,044	15,115,089	36,250,311	*231,267
Gypsum, tons	578,458	1,324,620	639,698	1,477,589	*152,969
Natural gas, M. ft.	15,286,803	2,362,700	20,345,763	3,338,314	*975,614
Petroleum, brls.	243,336	345,050	228,080	406,439	*61,389
Salt, tons.	95,053	459,582	100,791	491,280	*31,698
Cement, brls.	7,132,732	9,106,556	8,658,922	11,227,284	*2,120,728
Clay products		10,575,869		9,673,067	†902,802
Lime, bush.	8,475,839	1,844,849	7,671,381	1,605,812	†239,037
Stone.		4,726,171		5,199,204	*473,033
Miscellaneous non-metallic		3,973,823		4,384,001	*410,178
Total non-metallic		\$73,875,543		\$77,903,226	*\$4,027,683
Grand total		\$135,048,296		\$144,031,047	*\$8,982,751

The decreases in clay products and lime were respectively 8.5 per cent. and 12.9 per cent.

The record of annual mineral production in Canada since 1886 shows the rapid growth of the industry, not only has the total output increased from a little over \$10,000,000 in 1886 to its present output, but the average production per capita has increased from \$2.23 per capita to \$18.57, or eight times the rate shown by the first record.

Annual Mineral Production in Canada Since 1886.

Year.	Value of production.	Value per capita.	Year.	Value of production.	Value per capita.
1886....	\$10,221,255	\$2.23	1900....	\$64,420,877	\$12.04
1887....	10,321,331	2.23	1901....	65,797,911	12.16
1888....	12,518,894	2.67	1902....	63,231,836	11.36
1889....	14,013,113	2.96	1903....	61,740,513	10.83
1890....	16,763,353	3.50	1904....	60,082,771	10.27
1891....	18,976,616	3.92	1905....	69,078,999	11.49
1892....	16,623,415	3.39	1906....	79,286,697	12.81
1893....	20,035,082	4.04	1907....	86,865,202	13.75
1894....	19,931,158	3.98	1908....	85,557,101	13.16
1895....	20,505,917	4.05	1909....	91,831,441	13.70
1896....	22,474,256	4.38	1910....	106,823,623	14.93
1897....	28,485,023	5.49	1911....	103,220,994	14.42
1898....	38,412,431	7.32	1912....	135,048,296	18.27
1899....	49,234,005	9.27	1913....	144,031,047	18.57

The continuance during 1913 of the labor strike at the mines of the Canadian Collieries (Dunsmuir) Ltd., and its extension to the other collieries on Vancouver Island, seriously restricted the coal output from this district. The total value of the metals was also somewhat smaller than it might otherwise have been because of the slightly lower average prices obtained for copper and silver. A restricted demand was also reported during the latter part of the year for brick and other clay products and structural materials. While these are some of the influences that have tended to curtail the mineral output during the year, there have on the other hand been important increases in the production of gold, nickel, lead, among the metals, in asbestos, natural gas and many of the other lesser valuable non-metal products and in cement, resulting in the net increases already shown.

Mineral Production by Provinces, 1912 and 1913.

	1912		1913	
	Value of production.	Pct. of total.	Value of production.	Pct. of total.
*Nova Scotia	\$18,922,236	14.01	\$19,305,545	13.40
New Brunswick	771,004	0.57	1,049,932	0.73
Quebec	11,656,998	8.63	13,303,649	9.24
Ontario	51,985,876	38.50	58,697,602	40.75
Manitoba	2,463,074	1.83	2,211,159	1.54
Saskatchewan	1,165,642	0.86	899,233	0.62
Alberta	12,073,589	8.94	13,844,622	9.61
British Columbia	30,076,635	22.27	28,529,081	19.81
Yukon	5,933,242	4.39	6,190,224	4.30
Dominion	\$135,048,296	100.00	\$144,031,047	100.00

*Includes a small production of lime from Prince Edward Island.

The record of production by Provinces given in the accompanying table shows the relative importance of the several Provinces in practically the same order as last year, with the exception that Saskatchewan replaces New Brunswick in last position, due to a falling off in the coal and structural material production in the former Province and an increase in the coal, gypsum and natural gas production in the latter. Ontario has the largest output, with a value of \$58,697,602, or 40.75 per cent. of the total, a slightly higher proportion than in 1912. British Columbia is second with a value of \$28,529,081, or 19.81 per cent. of the total, a relative falling off; Nova Scotia takes third place, with a total production of \$19,305,545, or 13.4 per cent.; Alberta fourth, with \$13,844,622, or 9.6 per cent.; Quebec fifth, with \$13,303,649, or 9.24 per cent.

Increases are shown in each of the Provinces with the exception of Manitoba, Saskatchewan and British Columbia. The largest increase—36 per cent.—is exhibited by New Brunswick. The increases in the other Provinces were respectively: Alberta, 14.7 per cent.; Quebec, 14.1 per cent.; Ontario, 12.9 per cent.; Yukon,

4.3 per cent.; Nova Scotia, 2.0 per cent. The decreases were: Saskatchewan, nearly 23 per cent.; Manitoba, 10 per cent., and British Columbia, 5 per cent.

It should be remembered in dealing with these comparisons that Nova Scotia in the above record is given no credit on account of the large iron smelting and steel making industries at Sydney, New Glasgow, etc. The pig iron made here is entirely from imported ore and naturally is not credited as a Canadian mine output. The same remark applies to a large percentage of the pig iron production in Ontario as well as to the production of aluminum in Quebec.

The Mineral Production of Canada in 1913.
Subject to Revision.

Product.	Quantity.	Value.
Metallic.		
Copper, value at 15.269c. per pound, lbs..	76,975,832	\$11,753,440
Gold, oz.	784,525	16,216,131
Pig iron from Canadian ore, tons	73,508	996,429
Iron ore sold for export, tons	216,614	430,561
Lead, value at 4.659c. per pound, lb.	37,662,703	1,754,705
Nickel, value at 30c. per pound, lb.	49,676,772	14,903,032
Silver, value at 59.791c. per ounce, oz.	31,750,618	18,984,012
Cobalt and nickel oxides	689,511	689,511
Zinc ore, tons	7,535	400,000
Total		\$66,127,821
Non-Metallic.		
Actinolite, tons	66	720
Arsenic, white, tons	1,692	101,463
Asbestos, tons	136,951	3,330,909
Asbestic, tons	24,135	19,016
Coal, tons	15,115,089	36,250,311
Corundum, tons	1,177	137,036
Feldspar, tons	15,935	56,841
Graphite, tons	2,162	90,282
Grindstones, tons	4,284	43,900
Gypsum, tons	639,698	1,477,589
Magnesite, tons	770	4,620
Mica, tons		170,112
Mineral pigments—		
Barytes, tons	641	6410
Ochres, tons	5,987	41,774
Mineral water		173,677
Natural gas, M. cu. ft.	20,345,763	3,338,314
Peat, tons	2,600	10,100
Petroleum, value at \$1.782 per barrel, brls.	228,080	406,439
Phosphate (returns not complete), tons..	25	217
Pyrites, tons	228,811	638,185
Quartz, tons	78,261	169,842
Salt, tons	100,791	491,230
Talc, tons	12,250	45,980
Tripolite, tons	620	12,138
Total		\$47,517,155
Structural Materials and Clay Products.		
Cement, Portland, brls.	8,658,922	\$11,227,284
Clay products—		
Brick, common, pressed, paving		7,709,224
Sewerpipe		920,973
Fireclay, drain tile, pottery, etc.		1,037,870
Kaolin, tons	500	5,000
Lime, bush.	7,671,381	1,605,812
Sand and gravel		1,712,256
Sand-lime brick		962,004
Slate, sq.	1,432	6,444
Stone—		
Granite		1,644,183
Limestone		3,087,991
Marble		250,373
Sandstone		216,667
Total structural materials and clay products		\$30,386,071
All other non-metallic		47,517,155
Total value, metallic		66,127,821
Grand total, 1913		144,031,047

The average monthly prices of the metals in cents per pound for several years past are shown herewith, and reference is made elsewhere to the changes in prices here shown in 1913 as compared with 1912. A peculiar feature of the changes is the fact that there was a falling off in the average price of lead on the New York market, but an increase in the average price in London.

Average Monthly Prices of the Metals (cents).

	1908.	1909.	1910.	1911.	1912.	1913.
Copper, New York	13.28	12.982	12.738	12.376	16.341	15.269
Lead, New York	4.200	4.273	4.446	4.420	4.471	4.370
Lead, London	2.935	2.839	2.807	3.035	3.895	4.072
Lead, Montreal*	3.364	3.268	3.246	3.480	4.467	4.659
Nickel, New York	43.000	40.000	40.000	40.000	40.000	40.000
Silver, New York	52.864	51.503	53.486	53.304	60.335	59.791
Spelter, New York	4.720	5.503	5.520	5.758	6.943	5.648
Tin, New York	29.465	29.725	34.123	42.281	46.096	44.252

*Quotations furnished by Thos. Robertson & Co., Montreal.

Smelter Production.

General statistics showing the quantities of ore treated at smelters and the quantities of refined metals or smelter products obtained have been collected by this branch since 1908. It should be explained that the accompanying statistics include the treatment of a small quantity of imported ores chiefly in the British Columbia smelters.

The total quantity of ore, concentrates, etc., treated in 1913 was 3,027,085 tons as compared with 3,005,410 tons in 1912.

The ores treated may be conveniently classified as follows:

Ores Treated in Canadian Smelters.

	1911.	1912.	1913.
Nickel-copper ores	610,834	725,065	823,403
Silver-cobalt-nickel-arsenic ores	9,330	8,097	5,818
Lead and other ores treated in lead furnaces	55,408	59,932	78,110
Copper-gold-silver ores	1,517,981	2,212,316	2,119,754
Total	2,193,553	3,005,410	3,027,085

The products obtained in Canada from the treatment of these ores include refined lead produced at Trail, B.C., and fine gold, fine silver, copper sulphate and antimony produced from the residues of the lead refinery there; silver bullion, white arsenic, nickel oxide and cobalt oxide produced in Ontario from the Cobalt district ores. In addition to these refined products blister copper, copper matte, nickel-copper matte, cobalt material or mixed cobalt and nickel oxides are produced and exported for refining outside of Canada.

The aggregate results of smelting and refining operations may be summarized as in the next table. Unfortunately the figures cannot be taken to represent the total production from smelting ores mined in Canada, since considerable quantities of copper and silver ores are still shipped to other smelters outside of Canada for smelting.

Products of Canadian Smelters.

a.	—1912—		—1913—	
	b	c	b	c
Gold, oz.	12,118	184,815	11,977	213,279
Silver, oz.	17,572,217	686,171	13,789,709	934,601
Lead (including secondary lead), lb.	35,893,190		39,468,729	
Copper, lb.		58,405,910		59,245,722
do sulphate, lb.	87,110		130,533	
Nickel, lb.		44,841,542		49,676,772
*Nickel and cobalt oxides, etc., lb.	349,054		1,644,185	
White arsenic, lb.	4,090,768		3,384,249	

aRefined products produced and metals contained in refined smelter products exported. bRefined products. cMetals contained in matte blister, base bullion and speiss. *Nickel oxide, cobalt oxide and cobalt material, speiss, etc., not all completely refined.

Smelter products shipped out of Canada for refining were blister copper carrying gold and silver values 15,270 tons in 1913, as compared with 17,063 tons in 1912, copper matte carrying gold and silver values 5,159 tons in 1913, as against 6,727 tons in 1912, and bessemer nickel-copper matte carrying small gold and silver values as well as metals of the platinum group 47,150 tons in 1913, as compared with 41,925 tons in 1912.

Gold

The gold production of 1913 is estimated at \$16,216,131, which compared with the production of the previous year shows an increase of \$3,567,337.

The Yukon placer production in 1913 is estimated at \$5,835,554, as against 5,576,493 in 1912, the total amount on which royalty was paid during the calendar year according to the records of the Department of Interior being 352,900.04 oz. in 1913, and 335,015.67 oz. in 1912.

The British Columbia production in 1913 was \$6,136,000, of which the placer production as estimated by the Provincial Mineralogist was \$540,000. Smelter recoveries and bullion from milling ores being estimated as \$5,596,900.

The main feature of the year was the large increase from the Porcupine district of Ontario.

British Columbia and the Yukon also show substantial increases, while the estimates for Nova Scotia and Quebec show decreases.

The export of gold bearing dust nuggets, gold in ore, etc., in 1913 were valued at \$12,770,838.

Gold in bars, blocks, ingots, etc., were imported in 1913 to the value of \$840,435.

Silver.

The estimated production of silver in 1913 was 31,750,618 fine oz., valued at \$18,984,012, a decrease of 204,942 oz. and \$456,153 from 31,955,560 oz. valued at \$19,440,165 in 1912.

Of the 1913 production 28,452,737 oz. were from Ontario and 3,208,122 from British Columbia.

For British Columbia the figures represent the recovery in mill bullion or as silver contained in smelter products, while for Ontario the figures represent the silver contained in gold ores milled or smelted and in bullion shipments from Cobalt, to which is added the silver contents of the Cobalt ore and concentrate shipped, less five per cent. allowed for smelter losses.

The total shipments of ore and concentrates from the mines of Cobalt and the adjacent districts were about 44,106 tons, containing approximately 22,031,564 fine oz., in addition to which 7,482,833 fine oz. were shipped as bullion. Of this tonnage about half was treated in the camp itself in customs reduction works.

In Quebec the silver was derived from the pyritic ores of the Eastern Townships.

The exports of silver in ore, etc., as reported by the Customs Department were 37,371,569 oz., valued at \$21,441,220. There was also an importation of silver in bars, blocks, sheets, etc., valued at \$840,245.

The price of silver in New York varied between a maximum of 63¾ cents in January and a minimum of 56⅞ cents per oz. in March, the average monthly price being 59.791 cents per oz., compared with an average of 60.835 cents in 1912.

Copper.

The Canadian production of copper is represented by the copper contents of smelter products, matte, blister copper, etc., together with the amount of copper contained in ores exported, estimated as recoverable.

The total production on this basis in 1913 was 76,975,832 lb., valued at \$11,753,440, as compared with 77,832,127 lb., valued at \$12,718,548 in 1912, a decrease in quantity of 856,295 lb., and in value of \$965,108.

Quebec Province is credited with a production of 3,455,887 lb., as against 3,282,210 lb. in 1912, the increase being due to the increased production from the pyritic ores of the Eastern Townships.

Ontario's production in 1913 was 25,884,836 lb., as compared with 22,250,601 lb. in 1912, being mainly derived from the nickel-copper ores of the Sudbury district.

British Columbia had an output of 45,791,579 lb.

From the Yukon the Pueblo mine was the heaviest shipper.

The New York price of electrolytic copper varied during the year between 17.45 cents per lb. in January and 14.05 cents in December, the average for the

year being 15.269 cents as against an average monthly price of 16.341 cents in 1912.

The total imports of copper in 1913 were valued at \$7,415,008, divided into crude and manufactured 41,011,961 lb., valued at \$6,935,822, other manufactures valued at \$371,226, copper sulphate 2,037 lb., valued at \$107,960.

The exports of copper were: Fine in ore, matte, etc., 81,879,080 lb., valued at \$9,479,480, black in pigs 771,280 lb., valued at \$123,431.

Lead.

The total smelter production of lead in 1913 was 39,468,729 lb., but this includes lead from American ores and lead contained in scrap, etc., re-smelted, the recovery from Canadian ores being 37,662,703 lb., valued at \$1,754,705, an average of 4.659 cents per lb., the average wholesale or producer's price of pig lead in Montreal for the year.

In 1912 the production was 35,763,476 lb., valued at \$1,597,554.

The shipments were practically all from British Columbia mines in 1913, though a small production is reported from Ontario and the Yukon.

The mines of British Columbia were very active during the year, and the total lead contents in ores shipped is estimated as slightly in excess of 54,000,000 lb. Allowing for "lag" and the losses due to smelting, the increased difference between ore contents and smelter recovery would indicate that a considerable amount of lead ore was in stock at the close of the year.

The exports of lead ore, etc., are given as 329,960 lb., valued at \$9,136.

The total value of the imports of lead and lead products in 1913 was \$1,215,434, including old scrap and pig 11,199,500 lb., valued at \$464,117, manufactured lead 9,865,980 lb., valued at \$320,797, manufactures N.O.P., \$155,179, and litharge and lead pigments \$275,341.

The average monthly price of lead in Montreal during 1913 was 4.659 cents. This is the producer's price for lead in car lots as per quotations kindly furnished by Messrs. Thos. Robertson & Co.

The average monthly price of lead in New York during the year was 4.370 cents, and in London £18.743 per long ton, equivalent to 4.072 cents per lb.

The amount of bounty paid during the twelve months ending December 31, 1913, on account of lead production was \$57,956.70, as compared with \$118,425.74 in 1912.

Nickel.

There was a greatly increased output in 1913 from the mining and smelting of the nickel-copper ores of Sudbury district, Ontario. The companies operating being the Canadian Copper Co. and the Mond Nickel Co., operating mines and smelters, and the British America Nickel Corporation developing its ore bodies. In addition shipments were made from the Alexo mine at Kelso Mines to the Mond smelter at Coniston.

During the year the Mond Nickel Company completed their new smelter at Coniston.

The ore is smelted to a Bessemer matte containing 77 to 82 per cent. of the combined metals, and shipped in that form to Great Britain and the United States for refining. A portion of the matte produced by the Canadian Copper Co. is used for the direct production of monel metal, an alloy of nickel and copper without the intermediate refining of either metal.

There is also a small recovery of nickel in the form of nickel oxide from the Cobalt district ores.

The total production of matte in 1913 was 47,150

tons, valued by the producers at the smelters at \$7,076,945, an increase of 5,225 tons, or more than 12½ per cent. over the production of 1912. The metallic contents were copper, 25,875,546 lb. and nickel 49,676,772 lb. The amount of ore smelted was 823,403 tons, which included shipments from the Alexo mentioned above.

The aggregate results of the operations on the nickel ores during the past four years were as follows, in tons of 2,000 lb.

Production from Nickel-Copper Ores (in tons of 2,000 lb.)

	1910.	1911.	1912.	1913.
Ore mined	\$652,392	\$612,511	\$737,584	\$784,697
Ore smelted ...	628,947	610,834	725,065	823,403
Bessemer matte produced	35,033	32,607	41,925	47,150
Copper content of matte ...	9,630	8,966	11,116	12,938
Nickel content of matte ...	18,636	17,049	22,421	24,838
Spot value of matte ..	\$5,380,064	\$4,945,592	\$6,303,102	\$7,076,945

Nickel Contained in Matte Exported (pounds).

Exported to	1910.	1911.	1912.	1913.
Great Britain ..	5,335,331	5,023,393	5,072,867	5,164,512
United States ..	30,679,451	27,596,578	39,148,993	44,224,119
Other countries ..	.....	.....	.....	70,386
	36,014,782	32,619,971	44,221,860	49,459,017

The price of refined nickel in New York remained constant throughout the year, quotations in the Engineering and Mining Journal, being for large lots, contract business 40 to 45 cents per lb. Retail spot from 50 cents for 500 pound lots up to 55 cents for 200 lb. lots. The price for electrolytic is 5 cents higher.

Iron.

Iron Ore.—The iron ore shipments from Canadian mines during 1913 amounted to 307,634 short tons, valued at \$629,843. These shipments included 92,386 tons of hematite and roasted siderite, 209,886 tons of magnetite and concentrates and 5,362 tons of titaniferous ore.

The total ore shipments in 1912 were 215,883 short tons, valued at \$523,315, and included 128,912 tons classed as magnetite, and 86,971 as hematite.

Exports of iron ore from Canada during 1913 were recorded by the Customs Department as 126,124 tons, valued at \$426,681. These were from Ontario, New Brunswick, Nova Scotia and Quebec.

Imports of iron ore, according to Customs records, in 1913 were 1,942,325 tons, valued at \$3,877,824.

Shipments from the Wabana mines, Newfoundland, in 1913 by the two Canadian mines operating there were 1,605,920 short tons, of which 1,048,432 tons were shipped to Sydney and 557,488 tons to the United States and Europe.

Pig Iron.—The total production of pig iron in Canadian blast furnaces in 1913 was 1,128,967 tons of 2,000 lb., valued at approximately \$16,540,012, as compared with 1,014,587 tons, valued at \$14,550,990 in 1912.

Of the total production of 1913, 23,696 tons were made with charcoal as fuel and 1,105,271 tons with coke.

The classification of the production, according to the purposes for which it was intended, was as follows: Bessemer 265,685 tons, basic 614,845 tons, foundry and miscellaneous 248,437 tons. The amount of Canadian ore used during 1913 was 139,436 tons, imported ore 2,110,828 tons, mill cinder, etc., 33,583 tons.

The amount of coke used during the year was 1,417,148 tons, comprising 710,260 tons from Canadian coal and 706,888 tons of imported coke or coke made from

imported coal. There were also used 2,206,191 bushels of charcoal. Limestone flux used amounted to 630,119 tons.

In connection with blast furnace operations, there were employed 1,589 men and \$1,149,345 was paid in wages.

There was also a production in 1913 in electric fur-

mill stock No. 1 includes mill fibre valued at from \$30 upwards, No. 2, from \$15 to \$30, and No. 3, under \$15.

The total sales of crude in 1913 were 5,660.3 tons, valued at \$989,162, or an average of \$174.75, as against sales in 1912 of 5,662.9 tons, valued at \$890,351, or an average of \$157.22, practically the same quantity, but at a higher average price.

The Production of Pig Iron by Provinces in 1912-1913.

	1912			1913		
	Tons.	Value.	Value per ton.	Tons.	Value.	Value per ton.
Nova Scotia	424,994	\$6,374,910	\$15.00	480,068	\$7,201,020	\$15.00
Ontario	589,593	8,176,089	13.87	648,899	9,338,992	14.39
	1,014,587	\$14,550,999	\$14.34	1,128,967	\$16,540,012	\$14.65

naces of 8,075 tons of ferro alloys, valued at \$493,018, compared with 7,834 tons, valued at \$465,225 in 1912.

The exports of pig iron during the year are reported as 6,326 tons, valued at \$351,646, an average of \$55.58 per ton. Probably the greater part of this is ferro-phosphorus produced at Buckingham, and ferro-silicon and ferro-manganese produced at Welland.

There were imported during the year 253,843 tons

The total sales of mill stock in 1913 were 131,291 tons, valued at \$2,841,747, or an average of \$21.64 per ton, as against 105,898 tons in 1912, valued at \$2,227,221, or an average of \$21.03 per ton, a large increase in quantity, but at substantially the same average price.

There was a falling off in the amount of both crude and mill fibre in stock at the end of the year.

Output Sales and Stocks of Asbestos in 1913.

	Output.		Sales		Stock on hand Dec. 31.		
	Tons.	Tons.	Value.	Per ton.	Tons.	Value.	Per ton.
Crude No. 1	2,015.4	1,853.3	\$531,200	\$286.62	880.5	\$247,877	\$281.52
Crude No. 2	3,010	3,807	457,962	120.29	1,522	178,789	117.47
Mill stock No. 1	23,444	26,198	1,229,908	46.95	6,755	350,165	51.84
Mill stock No. 2	58,592	60,164	1,201,215	19.97	4,809	108,285	22.52
Mill stock No. 3	45,503	44,929	410,624	9.14	6,820	54,604	8.01
Total asbestos	132,564.4	136,951.3	\$3,830,909	\$27.97	20,786.5	\$939,720	\$45.21
Asbestic		24,135	\$19,016	\$0.79			

Output Sales and Stocks of Asbestos in 1912.

	Output.		Sales		Stock on hand Dec. 31.		
	Tons.	Tons.	Value.	Per ton.	Tons.	Value.	Per ton.
Crude No. 1	1,458.8	1,937.9	\$510,154	\$263.25	866.8	\$221,289	\$255.29
Crude No. 2	3,290	3,725	380,197	102.07	2,789	303,063	108.66
Mill stock No. 1	21,522	21,679	945,994	43.64	8,059	379,904	47.14
Mill stock No. 2	36,872	44,819	895,322	19.79	6,301	132,970	21.10
Mill stock No. 3	39,616	39,400	385,905	9.79	5,272	45,976	8.72
Asbestos	102,758.8	111,560.9	\$3,117,572	\$27.95	23,287.8	\$1,083,202	\$46.51
Asbestic		24,740	\$19,707	\$0.80			

of pig iron valued at \$3,234,877, charcoal pig iron 926 tons, valued at \$12,528, and ferro-manganese, ferro-silicon, etc., 30,355 tons valued at \$940,443.

Asbestos.

Activity in the production of asbestos in 1913 was confined to the districts of Black Lake, Thetford and Danville in Quebec. None of the quarries formerly operated at East Broughton were worked, although small shipments were made by one firm from stock.

The output and shipments in 1913 exceeded those of all previous years, the increase in sales over 1912 being 22.75 per cent.

The total output in 1913 was 132,564 tons, as against 102,759 tons in 1912, an increase of 29,805 tons, or 29 per cent. The sales and shipments of asbestos fibre in 1913 were 136,951 tons, valued at \$3,830,909 or an average of \$27.97 per ton as against sales in 1912 of 111,561 tons valued at \$3,117,572 or an average of \$27.95. Stock on hand at December 31, 1913 was reported as 20,786 tons as compared with stocks of 23,288 tons at the beginning of the year.

The number of men employed in mines and mills was 2,951 and amount paid in wages \$1,687,957.

The total quantity of asbestos rock sent to mills is reported as 2,110,990 tons, which with a mill production of 127,539 tons shows an average estimated content of about 6.04 per cent. of fibre in the rock.

A new mill is in course of construction at Danville.

The output and sales of crude and mill stock separately is shown for 1912 and 1913 in tabulated statements following. The classification is based on valuation, crude No. 1, comprising material valued at \$200 per ton and upwards, and crude No. 2, under \$200;

Exports of asbestos during the twelve months ending December 31, 1913, were 103,812 tons, valued at \$2,848,047, as against 88,008 tons valued at \$2,349,353 exported in 1912. There was also an export of manufactures of asbestos in 1913 valued at \$73,446.

Coal and Coke.

The coal mining industry in Canada in 1913 was marked by an increased production in the Maritime Provinces of Nova Scotia and New Brunswick and in the Province of Alberta and a falling off in the Provinces of Saskatchewan and British Columbia. In the latter Province the decrease was entirely due to the continuance throughout the year of the labor strike in the mines on Vancouver island. The lessened production in these two Provinces was, however, more than offset by the increased output in Alberta and Nova Scotia, so that the net result for the year was an increase of about 602,260 tons, or 4.15 per cent.

The total production of marketable coal for the year comprising sales and shipments, colliery consumption and coal used in making coke, etc., was 15,115,089 short tons, valued at \$36,250,311, as against 14,512,829 tons, valued at \$36,019,044 in 1912. Nova Scotia shows an increase of 188,839 tons, or 2.4 per cent., Alberta an increase of 903.80 tons, or 27.9 per cent., Saskatchewan a decrease of 16,167 tons, or 7.1 per cent., and British Columbia a decrease of 494,548 tons, or 15.4 per cent. The figures for the Yukon represent for 1913 the production from the Tantalus field only, no record having as yet been received of the output below Dawson.

The production by Provinces during the past three years is given on the next page:

Production of Coal by Provinces.

Province.	1911		1912		1913	
	Tons.	Value.	Tons.	Value.	Tons.	Value.
Nova Scotia	7,004,420	\$14,071,379	7,783,888	\$17,374,750	7,972,727	\$17,796,265
British Columbia	2,542,532	7,945,413	3,208,997	10,028,116	2,714,449	8,482,653
Alberta	1,511,036	3,979,264	3,240,577	8,113,525	4,144,377	9,462,836
Saskatchewan	206,779	347,248	225,342	368,135	209,175	347,685
New Brunswick	55,781	111,562	44,730	89,560	70,311	140,622
Yukon Territory	2,840	12,780	9,245	44,958	4,050	20,250
Total	11,323,388	\$26,467,646	14,512,829	\$36,019,034	15,115,089	\$36,250,311

The exports of coal in 1913 were 1,562,020 tons, valued at \$3,961,351, as compared with exports of 2,127,133 tons valued at \$5,821,593 in 1912, a falling off of 565,113 tons, or over 26 per cent.

Imports of coal during the year included bituminous, round and run of mine 10,743,473 tons, valued at \$21,756,658; bituminous slack 2,816,423 tons, valued at \$4,157,622; and anthracite 4,642,057 tons, valued at \$22,034,839; or a total of 18,201,953 tons, valued at \$47,949,119.

The imports in 1912 were bituminous, run of mine, 8,491,840 tons, valued at \$16,846,727; bituminous slack 1,915,993 tons, valued at \$2,550,992 and anthracite 4,184,017 tons, valued at \$20,080,388, or a total of 14,595,810 tons, valued at \$39,478,037.

Thus the increase of imports of coal in 1913 amounted to a total of 3,606,143 tons, or nearly 25 per cent. The increase in the imports of bituminous run of mine being 2,251,633 tons, or 26.5 per cent., increased imports of slack 900,430 tons, or 47 per cent., increased imports of anthracite 458,040 tons, or 11 per cent.

The apparent consumption of coal during the year was 31,685,456 tons, as against a consumption of 26,934,800 tons in 1912. Of the consumption in 1913 about 42.8 per cent. was from Canadian mines and 57.2 per cent. imported.

Coke.—The total output of oven coke during 1913 was 1,157,133 tons of 2,000 lb. made from 2,147,913 tons of coal, of which 1,598,912 tons were mined in Canada and 549,001 tons imported. The total quantity of coke sold or used by the producers during the year was 1,530,499 tons, valued at \$5,547,694.

In 1912 the total output was 1,406,028 tons, and the quantity sold or used by the producers 1,411,229, valued at \$5,164,331.

The output by Provinces in 1913 was: Nova Scotia 920,526 tons, Ontario 411,643 tons, Alberta, 65,104 tons and British Columbia 319,860 tons. That of Ontario was entirely from imported coal.

By-products from coke ovens recovered during the year included 10,608 tons ammonia sulphate; 8,371,600 gallons of tar and 3,353,731 thousand feet of gas, and the total value would approximate \$866,150.

The ovens of the Acadia Coal Co. and Londonderry Iron & Mining Co. in Nova Scotia, the Atikokan Iron Co. in Ontario, the West Canadian Collieries and Leitch Collieries in Alberta, and the Canadian Collieries, Ltd., in British Columbia were idle throughout the year. At the end of the year there were 1,720 ovens in operation and 1,325 idle, as follows: Nova Scotia 572 active, 376 idle; Ontario 110 active, 100 idle; Alberta 134 active, 233 idle; British Columbia 904 active, 426 idle.

The exports of coke during 1913 were 68,235 tons, valued at \$308,410, and the imports 723,906 tons, valued at \$2,180,830. In 1912 the exports were 57,744 tons, valued at \$252,763, and the imports 628,174 tons, valued at \$1,702,856.

Petroleum and Natural Gas.

The production of crude petroleum in Canada was still confined during 1913 to the old established fields in Ontario, with a few barrels pumped from gas wells in New Brunswick.

The annual output has been steadily declining during the past six years, and shows a further falling off in quantity produced in 1913, although owing to the higher price obtained for oil a larger total value is shown than for 1912.

A bounty of one and a half cents per imperial gallon is paid upon the production of crude petroleum, the Bounty Act being administered and payments made by the Department of Trade and Commerce. According to the records of this department the total output of petroleum in 1913 was 228,080 barrels, or 7,982,798 gallons, on which a bounty of \$119,741.97 was paid. The total value of the production at the average price for the year, \$1.782 per barrel, was \$406,439.

The production in 1912 was 243,336 barrels, or 8,516,762 gallons, valued at \$345,050, or an average value of \$1.418 per barrel.

The average price per barrel at Petrolia during 1913 increased from a minimum on January 1 of \$1.65 to \$1.75 on April 16, \$1.84 on November 6, and \$1.89 on December 22.

The production in Ontario by districts as furnished by the Supervisor of petroleum bounties was in 1913 as follows, in barrels: Lambton 155,747, Tilbury 26,824, Bothwell 34,349, Dutton 4,610, Onondaga 4,172, and Belle River 464, or a total of 226,166 barrels. In 1912 the production by districts was: Lambton 150,272, Tilbury 44,727, Bothwell 34,486, Dutton 4,335, and Onondaga 7,115, or a total of 240,935 barrels.

The production in New Brunswick in 1913 was 2,111 barrels, as against 2,679 barrels in 1912 and 2,461 barrels in 1911.

Exports entered as crude mineral oil in 1913 were 3,650 gallons, valued at \$379, and refined oil 24,273 gallons, valued at \$3,188. There was also an export of naphtha and gasolene of 17,875 gallons, valued at \$4,284.

The total value of the imports of petroleum and petroleum products in 1913 was \$13,339,326, as against a value of \$11,978,053 in 1912. The imports have been increasing rapidly during the past few years.

Crude oil is being extensively used as a fuel on the Pacific Coast in both steamships and locomotives, and the wide use of the gasolene motor has created a big demand for gasolene. The total imports of petroleum oils, crude and refined, in 1913, were 222,779,293 gallons, valued at \$13,230,429, in addition to 1,628,837 lb. of wax and candles, valued at \$108,897. The oil imports included crude oil 162,062,202 gallons, valued at \$5,250,835; refined and illuminating oils 19,393,627 gallons, valued at \$1,386,440; gasolene 29,525,170 gallons valued at \$4,822,941; lubricating oils 6,789,451 gallons, valued at \$1,172,986, and other petroleum products 5,008,844 gallons, valued at \$597,227.

The total imports in 1912 were 186,787,484 gallons of petroleum oils, crude and refined, valued at \$11,858,533, in addition to 2,144,006 lb. of paraffin wax and candles, valued at \$119,520. The oil imports included: Crude oil 120,082,405 gallons, valued at \$3,996,842; refined and illuminating oils 14,748,218 gallons, valued at \$1,012,735; gasolene 40,904,598 gallons, valued at \$5,347,767; lubricating oils 6,763,800 gallons, valued at \$1,077,712, and other petroleum products 4,288,463 gallons, valued at \$423,477.

There was an increased importation in 1913 of all classes of oil with the exception of gasoline, the increases being most pronounced in crude oil and refined illuminating oil.

Natural Gas.—There was comparatively little change in the production of natural gas in Ontario, but a large increase in the production of New Brunswick and in Alberta. The total production in 1913 was approximately 20,345 million ft., valued at \$3,338,314, of which 828 million ft., valued at \$174,006, was from New Brunswick; 12,487 million ft., valued at \$2,092,400 from Ontario, and 7,030 million ft., valued at \$1,071,908 from Alberta.

The production in 1912 was reported as 15,287 million ft., valued at \$2,362,700, and included 174 million ft. from New Brunswick, valued at \$36,549; 12,529 million ft. from Ontario, valued at \$2,036,245, and 2,584 million ft. from Alberta, valued at \$289,906.

These values represent as closely as can be ascertained the value received by the owners or operators of the wells for gas produced and sold or used. The values do not represent what consumers have to pay, since in cases where transmission is by separately operated pipe line companies such cost is not included.

Cement.

The financial stringency during 1913 had an immediate effect in the restriction of building operations of

The total quantity of Portland cement, including slag cement and natural Portland made in 1913 was 8,880,983 barrels, an increase of 1,739,979 barrels or 24 per cent. over 1912. The quantity of Canadian cement sold or used was 8,658,922 barrels valued at \$11,227,284 or \$1.29 2/3 per barrel, an increase of 1,526,190 barrels or 22 per cent. and \$2,120,728 or 23 per cent. in total value. The total imports of cement were 889,324 cwt. equivalent to 254,092 barrels of 350 lb. each and valued at \$409,303 or an average of \$1.61 per barrel, as compared with imports of 1,434,413 barrels valued at \$1,969,529 or an average of \$1.37 in 1912. The total consumption of Portland cement, therefore, neglecting a small export was 8,913,014 barrels as compared with a consumption of 8,567,145 barrels in 1912, an increase of 345,869 barrels or only 4 per cent.

The average price per barrel at the works in 1913 was \$1.29 2/3 as compared with \$1.28 in 1912 and \$1.34 in 1911 and 1910.

The imports of cement in 1913 included 77,356 barrels from Great Britain, 172,298 barrels from the United States, 3,443 barrels from Hong Kong and 995 barrels from other countries. The average price per barrel was \$1.61 as against an average of \$1.37 on imports in 1912.

The consumption of Portland cement during each of the past five years was as follows:

Annual Consumption of Portland Cement.

Calendar Year.	Canadian.		Imported.		Total. Brls.
	Brls.	Pct.	Brls.	Pct.	
1909.....	4,067,709	97	142,194	3	4,209,903
1910.....	4,753,975	93	349,310	7	5,103,285
1911.....	5,692,915	90	661,916	10	6,354,831
1912.....	7,132,732	83.3	1,434,413	16.7	8,567,145
1913.....	8,658,922	97.1	254,092	2.9	8,913,014

Production of Cement in Canada (barrels).

	1910.	1911.	1912.	1913.
Portland cement sold	4,753,975	5,692,915	7,132,732	8,658,922
Portland cement manufactured	4,396,282	5,677,539	7,141,004	8,880,983
Stock on hand January 1	1,189,731	918,965	894,822	866,133
Stock on hand December 31	832,038	903,539	903,094	1,088,199
Value of cement sold	\$6,412,215	\$7,644,537	\$9,106,556	\$11,227,284
Wages paid	1,409,715	2,103,838	2,623,902	.....
Men employed	2,220	3,010	3,461	.....

Exports of Mine Products, 1913.

	Quantity.	Value.
Arsenic, lb.	2,606,767	\$107,094
Asbestos, tons	103,812	2,848,047
Asbestos sand, tons	24,766	138,737
Coal, tons.	1,562,020	3,961,351
Feldspar, tons	15,966	62,767
Gold, dollars . . . . .	.....	12,770,838
Gypsum, tons	417,302	504,383
Copper, fine, in ore, etc., lb.	81,879,080	9,479,480
Copper, black, in pigs, etc., lb.	771,280	123,431
Lead, metallic, in ore, etc., lb.	329,960	9,136
Nickel, in ore, etc., lb.	49,459,017	5,195,560
Platinum, oz.	158	7,929
Silver, oz.	37,371,569	21,441,220
Mica, lb.	817,152	240,775
Mineral pigments, cwt.	39,124	18,931
Mineral water, gals.	3,640	526
Oil, mineral, crude, gals.	3,650	379
Oil, mineral, refined, gals.	24,273	3,188
Ores—		
Corundum, tons	1,077	121,741
Iron, tons	126,124	426,681
Manganese, tons	8	303
Other ores, tons	10,835	658,808
Plumbago, cwt.	32,842	85,368
Pyrites, tons	46,066	211,640
Salt, cwt.	4,609	3,047
Sand and gravel, tons	644,633	440,956
Stone, ornamental, tons	1,942	687
Stone, building, tons	191,981	82,646
Stone, crushed, tons.	4,814	3,126
Other articles, dollars . . . . .	.....	124,392
Total value of exports of mine products . . . . .	.....	\$58,073,167

all kinds and its results are shown in the statistics of production and consumption of structural materials. In the case of cement, while a very substantial increase in production is shown, this has seemed chiefly to displace imported material, the increase in consumption being only 4 per cent., as against an increased production of 24 per cent. Canadian mills supplied over 97 per cent. of the consumption in 1913, as against 83 per cent. in 1912. The industry has been marked by the extension of old and the completion of new plants, the latter west of the Great Lakes. The total capacity of completed plants at the end of the year being about 50,000 barrels per day, as compared with 36,500 barrels at the end of 1912. New plants were placed in operation at Winnipeg, Marlboro, west of Edmonton, Princeton, B.C., and at Tod Inlet, Vancouver Island, B.C. The plants of the Imperial Portland Cement Co. at Owen Sound and of the Crown Portland Cement Co. were not operated during the year.

MINERAL PRODUCTION OF ONTARIO, 1913*

By T. W. Gibson

The total output of 1913 was again the largest in value in the history of the mining industry of Ontario. Compared with that of 1912 it shows an increase of 9.6 per cent., and with the output of 1911, an increase of 26.2 per cent.

In computing the values of the several products, the basis adopted remains the same as heretofore, viz., the selling value at the point of production and in the form produced. If credit were taken for the value of the nickel and copper at the prices of the refined metals, the aggregate production would be materially greater. For purposes of comparison with former years, and for what seem to be sound statistical reasons, the method which has always been employed in computing values is retained.

The figures are compiled from returns made to the Bureau of Mines by the owners or operators of mines, works and quarries under section 170 of the Mining Act of Ontario. Owing in part to the fact that smelter settlements for ore shipments made towards the close of the year are in some cases not received until after 15th January—the date when the returns are required to be forwarded—and in part to the dilatoriness of a few producers, the results are necessarily subject to revision, in the light of fuller information. It is believed, however, that in their final form the statistics for the year will not materially differ from those given herewith.

Metals.

There was an increase in the value of the metallic output as compared with 1912, of \$2,708,812, or 7.7 per cent. More than three-fourths of the total production of metals came from the nickel-copper, silver and gold mines of northern Ontario, which now constitute the chief stay of the Province's mining industry. The remainder is furnished by pig iron, made principally from imported ore. It is recognized that the extensive pre-Cambrian area of north Ontario, which has already shown so much richness, affords a most promising field for exploration, and it is perhaps not too much to hope that other Sudburys, Cobalts, Porcupines and Moose Mountains or Helens will yet be brought to light.

Gold.—There were 16 producing gold mines in 1913, 7 of which were in Porcupine, and 9 elsewhere. The Porcupine mines yielded 207,583 oz. of gold, or more than 94 per cent. of the whole production. Hollinger crushed 138,291 tons of ore for a yield of 118,558 oz., the average contents recovered per ton for the year being .857 oz. At the Dome 131,149 tons were treated and 59,912 oz. of gold obtained, the average recovery per ton being .456 oz. The mill at the Dome mine is being enlarged and its capacity increased from 40 to 80 stamps. The completed mill is expected to be in operation during the spring of 1914. There were 5 other producers at Porcupine, the principal of which were Porcupine Crown and McIntyre-Porcupine. In their combined operations they treated 53,705 tons of ore, which turned out 29,093 oz. of gold, or an average yield per ton of .541 oz.

From the other gold districts, the production was as follows: Kirkland Lake and Swastika, 4,183 oz., Long Lake, 5,879 oz., Larder Lake, 700 oz., Eastern Ontario, 1,065 oz., and Northwestern Ontario, 1,262 oz.

Much attention is being given to Kirkland Lake,

where is situated the Tough-Oakes mine. From this property 101,049 tons of selected ore were shipped, which contained a gross value of \$46,685 or \$462 per ton. In addition 1,975 tons of lower grade material were put through a small stamp mill and \$26,232.31 in gold recovered, or \$13.28 per ton. The veins at Kirkland Lake, which are quite narrow, are found in Timiskaming conglomerate and graywacke in contact with porphyry, and also in the latter. The Tough-Oakes and other claims have been acquired by English capitalists and the district is likely to be thoroughly tested.

Silver.—The production at Cobalt was a little less than in 1912, being 29,681,975 fine oz. as against 30,243,859—a decrease of 561,884 oz., or 1.85 per cent. High-water mark in this camp was apparently reached in 1911, when the yield was 31,507,791 oz. The process of decline is proving more gradual than did that of increase, the falling-off in two years being only 5.7 per cent. The price of silver last year was lower than in 1912, the average in New York for the twelve months being 59.791 cents per fine oz. as compared with 60.835 cents. The result was to reduce the return to the mining companies by \$853,934, the value of the output being \$16,555,001.

To obtain the total yield of silver, there should be added to the Cobalt output 42,956 oz. recovered from the auriferous ores of Porcupine and the other gold camps.

The life of the camp is being prolonged by the discovery of new veins, by the drainage of lakes so as to permit a more complete recovery of the deposits underlying them, and by an increasingly extensive concentration of low grade ore. Important veins were found last year when Kerr lake was drained, and a promising find was made in February, 1914, on the old Kerry lease in the bed of Peterson lake; the drainage of Cobalt lake is about to be begun; and a new 80 stamp concentration plant has been built to take the place of the Northern Customs plant, sold to an English syndicate, which has taken over the Cobalt Townsite and other mines.

The list of chief producers in 1913 is pretty much the same as the corresponding list for 1912. The ten leading mines were:

Nipissing	4,820,411 oz.
Coniagas	3,252,566 oz.
La Rose	2,592,775 oz.
Cobalt Townsite	2,314,602 oz.
McKinley-Darragh-Savage	2,228,832 oz.
Kerr Lake	2,072,407 oz.
Crown Reserve	1,776,678 oz.
Buffalo	1,752,199 oz.
O'Brien	1,240,931 oz.
Seneca-Superior	1,124,577 oz.

The only new name on this list is that of Seneca-Superior, which takes the place of Timiskaming. Nevertheless, there are some changes in precedence. The three leaders in 1912 are again at the head and in the same order, but Cobalt Townsite moves up to fourth place, Crown Reserve drops from fourth place to seventh, and O'Brien, which was tenth in 1912, is now ninth.

Of the whole production of silver, 28,105,505 oz. came from the mines of Cobalt proper, the yield from

*A Preliminary Report published by the Department of Lands, Forests and Mines, Ontario.

the outlying camps being as follows:

	oz.	oz.
Gowganda—		
Miller-Lake O'Brien	469,923	
Mann	32,447	
		502,370
South Lorrain—		
Wettlaufer-Lorrain.		248,992
Casey—		
Casey Cobalt		825,108
Total		1,576,470

The shipments of ore and concentrates have ceased to be an index of the output at Cobalt, since so large a proportion of the silver is now produced in the form of bullion. At the Nipissing mine both high grade and low grade ores are now refined into merchantable bars, the high grade mill treating not only the output of the Nipissing mine, but also a large tonnage of similar material from other mines of the camp. The shipments for 1913 were as follows:

Ore.	Tons.	Oz.
Ore	9,495	13,668,079
Concentrates	11,017	9,014,633
Bullion		6,999,263

The silver refineries outside of Cobalt have been reduced in number by two, the plant owned and operated by the Canadian Copper Co. at Copper Cliff having been closed, and the works of the Canada Smelting and Refining Co. at Orillia having been burned down. The refineries at Deloro and Merrittown owned respectively by the Deloro Mining and Reduction Co. and the Coniagas Reduction Co., continued in operation throughout the year. The Metals Chemical Co., of Welland, and the Dominion Refineries, of North Bay, also treated small quantities of ore. There were recovered and marketed by these works the following products.

Silver	oz.	11,345,128
White arsenic	lb.	2,450,758
Cobalt oxide	lb.	662,060
Nickel oxide	lb.	232,255
Cobalt and nickel oxides not separated	lb.	236,325

In addition to the cobalt oxides obtained by these refining plants, a considerable tonnage of residues was shipped by the Nipissing mine containing cobalt and nickel. The Canadian sources of cobalt oxide supply are now in control of the world's trade in this article. Under the provisions of the Metal Refining Bounty Act (7 Edw. VII., chapter 14), there was paid to the refining companies bounty amounting to \$9,659.06 on refined cobalt oxide, and \$4,703.53 on refined nickel oxide, produced in 1912. The bounty rate is six cents per pound on the metallic equivalent of the oxides.

Nickel.—The quantity of ore smelted at the nickel-copper works in 1913 was 823,403 tons, which produced 47,150 tons of bessemerized matte. The nickel contents amounted to 24,838 tons, valued in the matte at \$5,237,477. In 1912, the production was 22,421 tons, worth \$4,722,040, the increase being therefore a little under 11 per cent.

The operating companies are the Canadian Copper Co., and the Mond Nickel Co. Of the ore treated by the former, 418,525 tons were taken from the Creighton mine, 54,646 from Crean Hill, 56,439 from No. 2, and 86,665 from No. 3. The last mentioned mine is also known as the Frood. The Mond Co.'s ore was derived as follows: From the Garson mine, 113,403

tons; from Victoria No. 1, 38,592 tons; from North Star, 11,294 tons, and from Worthington, 537 tons. This company also received and smelted 4,596 tons of ore from the Alexo mine in the township of Dundonald, on the line of the T. & N. O. Railway, the product of which is similar in character to that of the Sudbury mines. The Mond Co. during the year removed their smelting plant from Victoria Mines to Coniston, some eight miles east of Sudbury, where they have erected a complete and well equipped plant. The British America Nickel Corporation have acquired the holdings of the old Dominion Nickel-Copper Co., and are developing the Murray and Whistle mines. They raised no ore during the year.

The satisfactory results obtained by diamond drilling at the Murray, Frood, Garson, Levack and other properties, disclosing, as they have, immense reserves of ore, have established nickel mining in Ontario on an assured basis.

Copper.—The matte produced at the Sudbury nickel-copper smelters furnished the only copper obtained in 1913, save for about 3 tons, which accompanied some concentrates shipped from the Timiskaming silver mine, Cobalt. The quantity was 12,941 tons, valued in the matte at \$1,840,492. This compares with 11,126 tons in 1912, worth \$1,584,310, an increase of about 16 per cent. The percentage of the copper to the nickel in the Sudbury matte last year was a little over 1 to 2.

Iron Ore and Pig Iron.—There were shipped from the iron mines of the Province last year 195,937 tons, valued at \$424,072. Of this quantity 165,454 tons were of ore as taken from the mine, the remaining 30,483 tons were composed of 22,327 tons of roasted siderite from the Magpie mine, 4,841 tons of concentrates from the Trenton plant of the Canada Iron Mines, and 3,315 tons of briquettes from the Grondal magnetic concentrating works at Moose Mountain. The latter mine, it is stated, will be in a position to ship 200,000 tons to the United States market in 1914. At the Magpie mine the Algoma Steel Corporation are enlarging the capacity of the roasting plant which was erected to treat the siderite ore of which that deposit is composed.

That the producing capacity of the iron mines of Ontario has not kept pace with the expansion of the blast furnace industry is evident from the fact that of 1,228,269 tons of ore smelted into pig iron last year in Ontario, only 132,708 tons, or 10.8 per cent., were of domestic origin. The remainder was imported from the United States. One reason for this is the immense supply of first-class ore to be had from the Mesabi, Vermilion and other Lake Superior ranges south of the international boundary line; another is the fact that the ores of a considerable proportion of the known deposits in Ontario require beneficiation before they can be smelted.

The output of pig iron continues to grow, the product of the furnaces being 648,899 tons in 1913, worth \$8,719,892, as against 589,593 tons in 1912, valued at \$8,054,369—an increase of 10 per cent. in quantity and 8 per cent. in value. There are now eleven blast furnaces in the Province; of these only one, that of the Atikokan Iron Co. at Port Arthur, was not in operation in 1913. During the year two new furnaces were blown in—one by the Canadian Furnace Co., Port Colborne, and the other by the Standard Iron Co., at Parry Sound. The last named uses charcoal as fuel.

Non-Metals.

The output of non-metallic products had a value of \$15,491,002, as against \$13,541,869 in 1912—a gain of \$1,949,133, or 14.3 per cent.

The increase was general throughout the list. Out of 24 products, five showed a decrease aggregating \$190,037, while the remaining 19 increased by \$2,139,170.

The largest falling off was in corundum, \$96,176; quartz receded by \$48,716, drain tile by \$27,874, arsenic by \$15,151 and mica by \$2,120.

On the other hand, Portland cement advanced by \$739,796, pressed brick by \$237,122, stone by \$163,314, natural gas by \$160,859, sewer pipe by \$135,670, common brick by \$105,644, iron pyrites by \$100,644, etc. Three of the Canada Cement Co.'s plants were shut down about the beginning of 1914, and will not likely be opened again this year.

Sand and gravel, of which statistics are given for the first time, show a production value of \$229,967.

It is noteworthy that although the output of petroleum continues to decline—the reduction in 1913 as compared with 1912 being 516,969 gallons—the value was greater by \$53,514.

Construction materials, as a whole, including brick of all kinds, lime, stone and cement, had an increased production of \$1,275,937, or 14.6 per cent., as follows:

Product.	1912.	1913.
Bricks.	\$4,034,405	\$4,398,304
Lime.	381,672	399,600
Stone.	953,839	1,117,153
Cement.	3,365,659	4,105,455
Total.	\$8,735,575	\$10,011,512

Notes.

Water Power.—The mines and metallurgical plants of northern Ontario are now for the most part operated by electricity generated by water powers. This is true of Cobalt, where falls and rapids on the Montreal and Matabitchewan rivers are utilized; of Sudbury, where the mines and smelters are supplied with power by the Spanish, Wahnapiatae and Vermilion rivers; of Porcupine, to which power is conducted from the Mattagami; of Michipicoten, where the Michipicoten and Magpie hoist the ore and operate the machinery at the Helen and Magpie mines; of the Canadian Exploration Co.'s gold mine at Long Lake, and of others. A new water power installation is being put in at Gowganda Lake to operate the Miller-Lake O'Brien silver mine, and a transmission line is under construction from the Blanche river at Charlton to work the gold properties in the new field at Kirkland Lake. Water powers are numerous in northern Ontario, and, as at Iroquois Falls, on the Abitibi river, are employed also to operate pulp and paper mills. They have been of great service to the mining industry in providing cheap power.

Profits.—The silver mining companies at Cobalt distributed over nine million dollars in dividends in 1913, raising the total since the beginning of the camp to nearly 50 million dollars. Adding profits to private owners, the whole distribution so far has been about 55 million dollars. The Hollinger gold mine during the twelve months paid out dividends amounting to \$1,170,000, making a total since the opening of the mine of \$1,440,000. Including nickel, construction materials, natural gas and other mineral products, the aggregate profits derived from the mining industry of the Province last year could not have been less than 15 million dollars.

SYSTEMATIC TIMBERING IN COAL MINES.

Owing to there having been a marked increase in fatalities from falls of roof and coal in coal mines in British Columbia, a circular letter, as under, was last year sent by the Chief Inspector of Mines to all coal mine managers in that Province:

"For a number of years past the percentage of total accidents from falls of roof and coal at the working faces has ranged from 35 to 60 per cent. of the total accidents due to the industry.

"I regret to say that during the first five months of the present year there have been 12 fatal accidents—or three more than during the whole of last year—from these causes.

"Owing to the large increase in this class of accident, the Hon. the Minister of Mines deems it necessary to avail himself of the powers given to him as set forth in Sec. 101 of the Coal Mines Regulation Act, and proposes in writing to the managers of the various collieries a special rule covering the question of 'Systematic Timbering and Spragging' at the working face.

"Recognizing that owing to the widely varying conditions in the different collieries in the Province—even in the same field, and often in the same mine—that a hard and fast rule on systematic timbering would render such rule often impracticable, making the same invalid and even often tending to bring about the very conditions it would be aimed to prevent; therefore, before formulating any such rule, the Minister, in keeping with his former policy, would like to avail himself of your assistance and co-operation in this very important matter, so the following proposed Special Rule is submitted for your consideration."

Here followed the proposed Special Rule:

A large majority of the managers in the Province heartily approved the Minister's suggestion, and all, with the exception of two or three who have since complied, were in a position to start the present year under a method of systematic timbering.

The Special Rule, as finally adopted, is uniform throughout the Province, the method of timbering under the rule having been provided for to suit the local conditions of each mine. The rule follows:

Special Rule—Systematic Timbering.

"(a) The manager of the mine shall cause to be posted at a conspicuous place near the mouth of the mine a notice stating the minimum size of the different types of timber to be used in such mine, and the maximum distance between the timbers and between the timbers and the face and sides of the working place.

"(b) In the event of two or more methods of timbering being used in one mine, then, in addition to the notice posted at the mouth of the mine, a notice shall be posted at the entrance to each section or district, stating the method of timbering to be used in such section or district of such mine.

"(c) It shall be the duty of the miner in charge of a working place—which shall include such working place and for a distance of 15 ft. back from the face—to keep the props, timbers or other roof supports erected as designated in the 'Notice of Systematic Timbering' governing the mine, division, or sub-division of such mine in which he is employed.

"(d) Nothing in this section shall prevent a miner from setting supports, or an official from requiring the miner to set supports, in his working place at more frequent intervals than those specified in the notice aforesaid, where necessary for safety.

"(e) Every miner in charge of a working place shall set sufficient sprags or other supports for the

undermined coal, provided that before commencing to mine he shall set one sprag or other support, and not less than one for every six feet of such undermining.

"(f) Temporary props shall only be withdrawn by use of a dog and chain or other type of timber-drawing machine, unless permanent timber has been set before such withdrawal, and no permanent prop, timber, or other roof support shall be finally withdrawn without the use of such timber-drawing device."

The comment of the Chief Inspector of Mines is: "I believe this is a step in the right direction, and I expect that results during 1914 will fully justify the adoption of this rule."

KIRKLAND LAKE FLOTATIONS.

Mr. T. A. Rickard, in the Mining Magazine, Feb., 1914, says:

The first of these made its appearance early in January with a statement, in lieu of prospectus, couched in terms of studied obscurity. However, it promised a lively gamble and won the support of those on the fringe of the Stock Exchange. The shares have risen since to a big premium, from £1 to 27/8. On January 15 the report of Mr. H. H. Johnson was published. This deals with the company's chief asset, an option on the Tough-Oakes mine, subsequently the basis for a subsidiary flotation. We have read Mr. Johnson's report with regret. It is a pity that he, as a member of the Institution, should have presented a document so open to criticism. He speaks of 'nuggets' in a vein; that term, of course, being applied only to placer gold. He says a good deal about telluride minerals without making it clear how it affects the value of the mine. It is probable that molybdenite has been mistaken for tellurides, although petzite, altaite and other base metal tellurides do occur. The test for a telluride is so easy that no excuse exists for confusion. In any case, the information as given is conflicting. Apparently the ore—because of the molybdenite—is not docile to amalgamation, for the extraction ranges from 51 to 64 per cent. only. This is compared with the extraction in the Village Deep mill, given as 54.4 per cent., to which 42 per cent. should be added for extraction by cyanidation. The description of the veins themselves is technically incorrect: Mr. Johnson talks about a "dip-strike," meaning probably the 'pitch'; and he says that "the strike in depth is greater than the length of the strike of the psychute (meaning 'ore-shoot') on the surface." Strike should be expressed in terms of the compass; it is a measure of direction. He asserts that "there is every reason to expect the veins to continue in depth, the values at 200 ft. being better than on the surface." There is no reason, unless by "depth" he means 300 ft. He does not discuss the one vital factor, namely, the relations of the veins to the porphyry, except in one obscure and inconclusive paragraph. Finally, as regards the known resources of the property, he finds a reserve of 31,000 tons valued at £220,000. But this estimate evidently did not please the 'management'—presumably the vendors—so he endorses the management's estimate of "over £400,000," explaining that he based his figures on the actual width disclosed in the workings, namely, 5 ft., "whereas the management no doubt takes credit for a width of about 10 ft., and it is only fair to say that recent crosscuts point to at least such a width and probably more being proved, and systematic crosscutting will, in my opinion, hear out the latter figure." Why, then, in the name of Agricola, does Mr. Johnson submit £220,000, or half of "over £400,000,"

as his estimate? He says he "cannot deviate from the accustomed practice of basing figures on the actual width disclosed by the drifts, etc., to date," but he assumes the average assay of ore in the shaft without having been able to see or sample it himself. He says that the ore 'blocked out' amounts to 12,000 tons averaging 26.9 dwt. "after neglecting the value of the crosscut," but on the next page he assumes an average (34.5 dwt.) that includes the high assay from this very crosscut. On the face of such contradictory statements his opinion of the ore available ceases to have any value in business. Indeed, the information forthcoming concerning the Tough-Oakes and the Kirkland Lake Proprietary is altogether unsatisfactory, and as it comes through a Rhodesian financial agency it must be discounted severely. Some rich ore has been discovered, and healthy prospects exist, but the evidence does not warrant the iridescent expectations expressed by the promoters. As far as the geology is concerned, the veins traverse a schistose conglomerate cut by feldspar porphyry, in the shape of dikes and intercalations.

On January 28 the prospectus of the Kirkland Lake Exploration was advertised. This is worse. The first company had at least secured an option on the richest mine in the district, but the second had only symptoms of indications of doing business. The chances are slight, for the best claims have already been optioned, and only wild-cats on the outside are likely to be available, or inflated schemes with the Kirkland Lake Proprietary, the shares of which are mentioned in the prospectus "as evidence of what is believed to be the value of this new gold-mining area"; as if such quotations afforded a measure of economic value. Nor does the personnel of the board encourage the expectation that "substantial profits" should be earned." It is true one of them is Dr. F. H. Hatch, but he has no special knowledge of mining in Ontario, and the name of the company's resident engineer is withheld. Out of 150,000 shares, 100,000 are optioned to the Anglo-Spanish Trust, with which two of the directors, Colonel Charles H. Villiers and Mr. George Cornwallis West, are connected. These two gentlemen have also taken a call on 5,000 and 20,000 shares, respectively. What is the consideration? Finally, why was Dr. Hatch given a call on 1,500 shares? Was it because his name gave an air of technical verisimilitude to an oblique financial performance? It is true, owing to sundry protests, he has surrendered this call, becoming consulting engineer as well as director, but it remains a thousand pities that the president-elect of the Institution of Mining and Metallurgy should be involved in an affair of this kind. It is nothing more or less than the creation of a counter for unintelligent gambling, only remotely related to the mining with which Dr. Hatch has had an honorable connection. Such blind pools are not adapted to joint stock finance; they should raise their capital privately and defer a public issue until they can furnish evidence that they have something to offer, besides the vague expectations of optimistic promoters.

TO MERGE COBALT PROPERTIES.

London, March 9.—The Daily Mail understands that a scheme is on foot for the amalgamation of some of the leading silver mining companies of the Cobalt field. The scheme includes the Cobalt Town Site Silver Mining Company, Cobalt Lake Mining Company, City of Cobalt Mining Company and the Cobalt property of Town Site Extension Mines. The amalgamated company will have a capital of about \$7,500,000.

GAS AND OIL FIELDS OF NEW BRUNSWICK*

By Mathew Lodge.

The existence of gas and oil in the Province of New Brunswick has been known for over sixty years. Possibly the early French settlers on the Peninsula between the Petitecodiac and Memramcook rivers may have lighted the seepages which occurred at various points in that part of the country. Even though they never succeeded in igniting the bubbles that formed on top of the springs, still, the continual disturbance of the waters in many places must have been a source of wonderment to these pioneers. One might allow his imagination to wander into the years prior to the settlement of this part of the country by the white man, and see the Malicite and the Micmac prostrating himself before the fire which he had by some accident lighted and worshipping it as did the men of old in Asia worship the sacred fires of Persia. Or, possibly, our Malicite "brother" was of a more practical turn of mind, and saw in this phenomenon an easier way to cook his bear steak than by gathering wood. And so we can imagine that the hill at Belliveau where one of these large springs still exists was a favorite camping ground.

We do know that the Seneca Indian of New York State were the first to know of the healing qualities of petroleum, which they in a crude way recovered from the springs by placing their blankets on the water and squeezing out the oil so gathered.

The first instance we find recorded of any practical use being made of the gas in the Province of New Brunswick was at Belliveau, the point above-mentioned, where, something like fifty years ago a Mr. Patrick sank several shafts in this district in a search for albertite, and tapped some of the upper gas sands. By placing a pipe into the wall of his shaft at the occurrence, he succeeded in obtaining a sufficient supply of gas to light his offices and workshops. So in the working of the old Albert mines, both oil and gas sands were known to exist, and caused the workmen considerable trouble.

Little value was placed upon these discoveries in what we may now term "the early days," because the value of these products commercially was very little known.

The history of the Albert mines has been so often written, that it is not necessary here to say more than that the Americans knew the value of the albertite and used it in the manufacture of coal oil, wax candles, and also for the enriching of manufactured gas, and until the great discoveries from 1858 to 1865 of liquid oil in Pennsylvania, a large operation was carried on in what was known as the Albert mines, in Albert County, New Brunswick.

Some far-seeing men in the United States and New Brunswick who knew of the oil and gas seepages at various points here recognized the same conditions existing as they found in Pennsylvania, and so as early as 1860, wells were drilled at St. Josephs, Memramcook and Dover on the peninsula before mentioned, and with some degree of success; for in practically all their wells they discovered oil. Their methods, however, were crude; they did not go to any great depth, and so only tapped the upper sands, and obtained only small flows of oil. There is nothing recorded in regard to the gas, but we presume they encountered about the same pressure as that recorded later in the drillings of the New Brunswick Petroleum Company at or near the same point. These early operations were under the direction of Mr. Merrill, of the Downer Oil Company of Boston

and Prof. Carroll; and the financial head of the business was Mr. Louis J. Emery, of Bradford, Penn.

As stated above, the early discoveries of oil were small, and the great oil field that was being opened up in Mr. Emery's own city was too great an attraction for him, and, therefore, he abandoned this field and went into the oil business in his own State, and afterwards built refineries in Bradford and became one of the oil magnates of Pennsylvania. Both Mr. Merrill and Prof. Carroll in after years told the writer that they still had unbounded confidence in the oil possibilities of New Brunswick.

So with a little dabbling here and there, nothing practical was undertaken until the year 1898, when many of the prominent business men of the Province became convinced of the fact that oil and gas in commercial quantities existed here, and acting on their conviction, presented a memorial to the Executive of the Province of New Brunswick inviting them to take under consideration possibilities which they believed existed and to grant them a concession covering a certain portion of the Province, and under conditions of a large expenditure to be made by them in drilling operations; that they the memorialists would undertake to form a company and supply capital to develop the Province.

The then Premier, Hon. H. R. Emmerson, gave the matter his favorable consideration and employed experts to report to him on the possibilities. After receiving these reports, he was so convinced of the soundness of the undertaking that he promoted an Order-in-Council and further legislation to grant these memorialists a portion of the Province to be explored for gas and oil.

The New Brunswick Petroleum Company, Ltd.

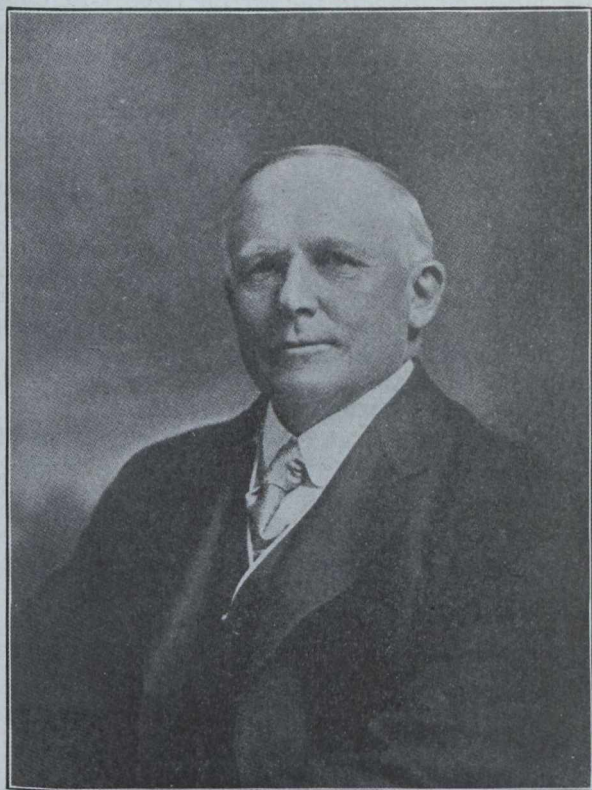
On the 16th day of September, 1899, the New Brunswick Petroleum Company, Ltd., secured its charter, but it was not until November, 1901, that the first drilling rig was erected on the farm of Ralph Steeves at Upper Dover. However, in the interim, the company's officers had not been idle. They were fortunate first in securing the co-operation of the Hon. B. F. Pearson, of Halifax, who agreed to help finance the proposition provided he were first satisfied there was a possibility of discovering gas and oil in commercial quantities. To that end, he secured the services of Prof. N. S. Shaler, of Harvard University, to make a thorough geological examination of the territory we controlled, and report.

Prof. Shaler first made personal investigation, and was well satisfied with the conditions found. However, he deemed it advisable to send his staff of engineers under the direction of Harold B. Goodrich, to examine in detail the geological structure of the country, so that Prof. Goodrich, during the summers of 1900 and 1901 with two other engineers, completed a most exhaustive examination of the district under the company's control.

Prof. Shaler personally visited the property many times during this examination, and in 1901 wrote to the N. B. Petroleum Company as follows:

"In view of the facts it appears to me to be an excellent mining venture to prosecute the inquiry under the conditions of your concession from the authorities of the Province. If oil is found, it is likely from the samples shown, to be of excellent quality. It will be near transportation, nearer, indeed, than any other

*From the Journal of Commerce, Montreal, Feb. 14, 1914.



Mr. Mathew Lodge

source of supply to the open sea. The conditions for refining will be excellent, and the market unlimited. You are doubtless aware of the fact that there is a prospect of considerable increase in the price of petroleum. The sources of supply are waning, and no important new fields have been discovered of late.

"The search for petroleum has always to be undertaken with a chance of failure, but I have not seen any field where the general conditions were on the whole more satisfactory than they appear to be here."

"You may say to any of your friends that I am decidedly of the opinion that the field is one eminently fit for exploration, and that the chance for finding oil and gas is extremely good. In fact, I have never seen an unexplored district where the promise is more distinct than in the region in which you are now boring."

You will note that Prof. Shaler was writing in the year 1901. Since that date, many of the great discoveries of oil have been made in parts of Russia, Roumania, Galacia, Persia, the East and West Indies, Mexico, Oklahoma, and much of Texas and California.

In 1903, Prof. Shaler again reported to us, in part, as follows. I only recite one paragraph, as his whole report is too lengthy for this article:

"The evidence already obtained justifies the forecast expressed by me a few years ago that petroleum in commercially important quantities existed in the Province of New Brunswick. The results obtained in no wise diminish my confidence in the discovery of oil and gas at many points in the Province over what will prove to be in the aggregate a very extensive area. Such explorations hereafter may advantageously be carried on elsewhere than at St. Josephs and Weldon and at much greater depth than required for the exploitation of the beds at those points."

You will note that at one point he mentions here, Weldon, we had only at that time bored two shallow holes and made a small discovery of gas and oil. Prof.

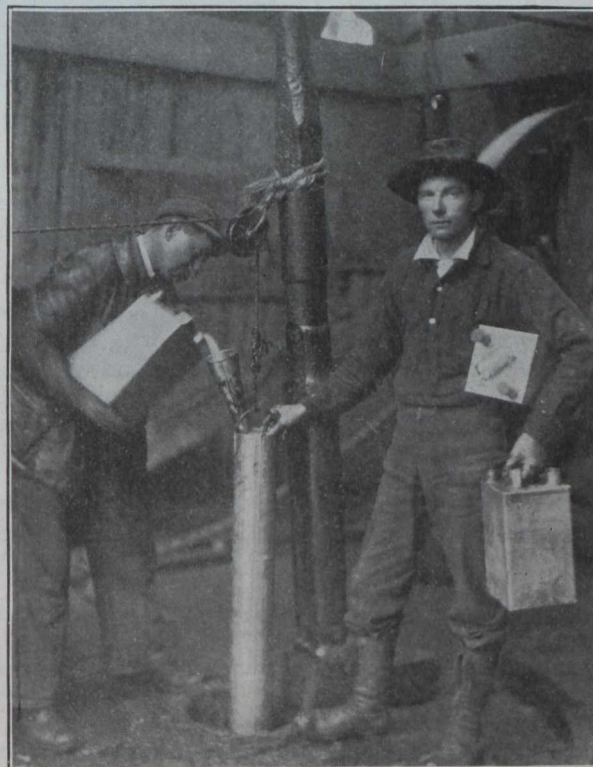
Shaler told us at that time we must proceed west from these two wells, and put down deep wells into the lower sands where he was confident we would make discoveries of both oil and gas. The N. B. Petroleum Company, however, were unfortunate in having their drilling rigs burned down at this point, and so for the next two years they prosecuted their work on the east side of the Petitcodiac at Dover and St. Josephs, where they secured many small wells of oil from the upper oil sand. And it was not until the Maritime Oilfields, Limited, an English and Scottish syndicate, who took a working option on our property in 1909, and who have since operated it with great success under the direction of Dr. J. A. L. Henderson, an English engineer, carried into effect Prof. Shaler's advice by drilling deeply west of Weldon, that the big gas wells were discovered.

Once more in gas and oil operation was demonstrated the wisdom of working from the known to the unknown; and Dr. Henderson is to be congratulated upon the fact that he has so ably followed this theory.

In 1905 the New Brunswick Petroleum Company, having expended some \$250,000 in development work, and having proven that oil and gas existed in commercial quantities, and feeling that they were not financially able to exploit the concession as it should be exploited, sent their officers to England for the purpose of raising large capital.

The Maritime Oilfields, Ltd.

However, during the years 1906, 1907 and 1908 it was practically impossible to raise money for the development of oil and gas fields, so that in January, 1909, our company gave a working option to an English syndicate who came under contract to expend a certain amount of money each year, and to explore our concession. From practically the outset, their success has been phenomenal. Their first large discovery of gas was made at Weldon about two thousand feet west of



Pouring Nitro-Glycerine into the Cylinders to Lower into Well for "Shooting" the Oil Sands

the wells drilled by the N. B. Petroleum Company; and they have been drilling westward and north and south along this line, distributing their wells about two thousand feet apart, and constantly going deeper, and with ever recurring successes of bigger wells than the first, until they have drilled in all, and completed, some forty wells.

The Maritime Oilfields, Ltd., the syndicate above referred to, have developed the field for about $4\frac{1}{2}$ miles westward from their first well, and have proven up about 50,000,000 cu. ft. of gas in the twenty-four hours, some of the wells from the deeper sand having a rock pressure of 550 pounds to the square inch.

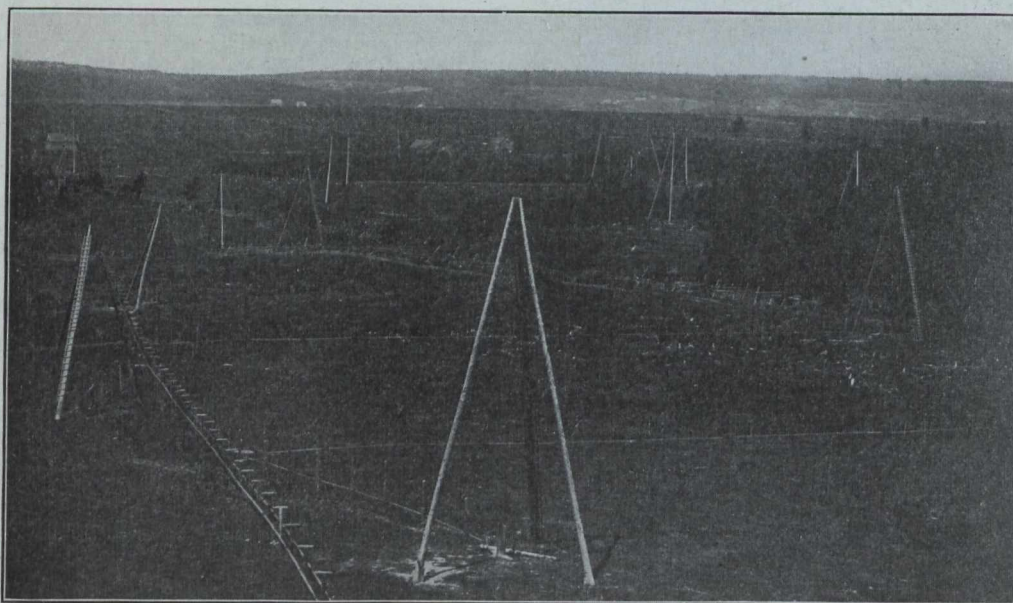
The syndicate, realizing that they had struck a big gas pool, confined their energies exclusively to the development of the gas. They have, however, in this district some seven small oil wells, and the writer learned only yesterday that a new oil sand had been struck at a depth of 2,025 ft., which shows great promise.

"We blew the wells in the air for twenty-four hours and made a careful measurement of the output at the end of that time, and find that the open flow production of the field at the present time is 33,186,000 cu. ft. per day."

This report is made on the production of seventeen wells.

Mr. W. P. Craig, the other expert, who is superintendent of the United Natural Gas Co., of Oil City, Penn., reports as follows:

"Referring to the gas field near Moncton, New Brunswick, that Mr. T. O. Sullivan and I inspected, would say that I find the sands that are producing gas in that field resemble the Bradford & Kane sands in the McKean and Elk County, Pennsylvania, fields very much. We found thirteen wells producing gas. We got a test on nine of these wells, which showed an open flow of 31,436,608 cu. ft. of gas daily, after blowing on an average of twenty-four hours. We had to estimate



A View of the New Brunswick Petroleum Company's First Oil Development at Dover, N.B.

Both Professor Shaler and Dr. Henderson had knowledge of this lower sand, and expected from it an extensive new oil area.

It may be well here to give in part the opinions of two of the best-known gas experts in America, on the present developed gas field.

These reports are dated February, 1912, and were made for the T. N. Barnsdall Company, of Pittsburg. The first was made by Mr. T. O. Sullivan, general manager of the Manufacturers' Light & Heat Company, Pittsburg, Pa.:

"The wells after blowing for twenty-four hours, showed but very slight decline in volume; in fact, so little as to be hardly noticeable after the first head was blown off."

"The gas is extremely dry; none of the wells showing water."

"I am enclosing herewith a report showing the rock pressure of the wells, and open flow measurements together with the total output of each well."

"I expect a report from Mr. Craig, Monday, expressing his opinion that this sand very closely resembles the Bradford and Elk County sands of the Pennsylvania field."

the flow of gas on the other four wells, as these wells produce some oil, and they had not been pumped for some time previous to the time we were there, and the gas was partly drowned out. Our estimate of the open flow of these four wells is 1,750,000 cu. ft. This would make a total amount of gas in that field, developed, at the present time, of 33,186,608 cu. ft. There were some other small wells that produced a small quantity of gas and some oil that we made no test or estimate of."

"I see no reason why gas should not extend over a large area in that country, as there has been nothing drilled to condemn the territory south of the Petitcodiac. The drilling done, I think, has been confined to too small an area to make a good test of the country." I would advise branching out south with each location about a mile apart, for several locations so as to test the extent of the territory before contemplating laying any lines to other towns than Moncton, as I would not consider the amount of territory defined at the present time, any more than would supply Moncton with gas, with a reasonable amount held in reserve for future use. As Mr. Sullivan took a map showing the location of the wells, and also a record of each well and a sample of the sand, it will not be necessary for me to explain

these conditions in this report, but I would mention here that from the nature of the gas bearing sands being so nearly like the Bradford and Kane sands for producing gas, I think very well of the Moncton gas territory, and think that development will find gas over a large area."

While Mr. Sullivan in his report speaks of seventeen wells, he is discussing all of the gas and oil wells in the field at that time; but you will note that Mr. Craig is more definite, and gives the production as practically coming all from nine wells. The other wells were smaller, and he did not take them into his calculation. The fact is, as recited before in this article, that the further they went west and the deeper they drilled, the better gas wells were developed.

Having established a desirable quantity of gas, we cannot do better here than submit the report of Dr. J. T. Donald, Official Analyst to the Dominion Government, which reads as follows:

Report of Natural Gas Received from Messrs. Maritime Oilfields, Limited, March 26, 1910.

Montreal, 8th April, 1910.

Specific Gravity	0.686
Weight of 1,000 cu. ft. (lbs.)	55
1,000 cu. ft. of gas produce (large calories).	320,000
1,000 cu. ft. of gas produce (British T. units)	1,280,000

Calorific Value Compared With Coal.

1,000 cu. ft. correspond in heating value to 95 lb. Pittsburg coal (1 lb. Pittsburg coal equal 12,272 B.T.U.)
 1,000 cu. ft. correspond in heating value to 85 lb. anthracite. (1 lb. anthracite equals 15,120 B.T.U.)

A natural gas from the Pittsburg district containing approximately:

- 64 per cent. Methane.
- 22 per cent. Hydrogen.
- 5 per cent Ethane.

has a calorific value as follows: 1,000 cu. ft. correspond in heating value to 54.4 lb. Pittsburg coal.

The luminosity of the gas is low, but its efficiency as a fuel very high.

(Signed) J. T. DONALD.

Analysis of New Brunswick Gas.

Oxygen	Trace.
Nitrogen	Trace.
Carbonic Oxide	None.
Carbonic Dioxide	None.
Illuminants	None.
Methane	73 p.c.
Ethane	27 p.c.

(Signed) J. T. DONALD, T.L.C.

As to the cost of gas in actual use in gas engines, the accompanying report of the Dominion Textile Company and its saving in comparison with coal is interesting. Here we have a saving of over 34 per cent. per hour and 39 per cent. on the cost per pound of goods produced.

Comparative Cost of Gas and Coal.

Moncton, N.B.

1911-12.	
Value of coal consumed plus labor	\$7,561.02
Loom hours run	8,153.50
Cost per loom hour . . . . .	.927
1912-13.	
Value of gas used	\$7,415.25
Loom hours run	9,662.68
Cost per loom hour . . . . .	.767
Saving in favor of gas (per loom hour) . . . . .	.160
17.26 p.c.	

(Signed) J. V. JACKSON.

The satisfaction of the domestic consumer can hardly be expressed in words. The saving over coal to those who have proper appliances for using it is over 25 per cent. In this, we do not include the saving of labor and the cleanliness to the householder. There is another item which will certainly place a long credit of good marks to the average Monctonian (especially of the male sex) in the books of the Recording Angel. With no more ashes to sift, no clinkers to dig out of the furnace, no more exploding stoves from pouring on kerosene, no cold coffee in the mornings, what total abstinence from profanity must characterize our citizens.

The gas was turned on the City of Moncton in March, 1912. The total consumption of gas for the twelve months ending November 30th, 1913, was 819,313,000 cu. ft.



75-foot Gas Flame at Weldon, N.B.

Besides the household and factory use of gas, the Intercolonial Railway charge all their express trains with it, instead of Pintsch gas, so the trains running into Montreal are lighted with Moncton natural gas. The expense to the I.C.R. is only a fraction of what it used to cost them for Pintsch gas.

The capital already invested in this enterprise for the exploration, pipe lines, and other plant, etc., is close on to \$1,500,000.

Pipe Lines.

The company have laid down ten miles of 10-inch high pressure gas mains from the wells to the city of Moncton, 5½ miles of 6-inch high pressure pipe line from the wells to the town of Hillsboro, 7¾ miles of

high pressure 4-inch pipe line in the town of Hillsboro, $8\frac{3}{4}$ miles of low pressure pipe line in the town of Hillsboro, $16\frac{1}{2}$ miles of 6 and 4-in. low pressure pipe line in the city of Moncton and suburbs, and $5\frac{1}{2}$ miles of 6-in. high pressure in Moncton and suburbs.

Number of domestic consumers, 1,812 in the city of Moncton, town of Hillsboro and suburbs of Moncton.

Number of factory consumers, 34 boiler and gas engines.

While natural gas has been an inestimable boon to the citizens of Moncton, it has not thus far attracted the number of manufacturers we at first supposed it would. We have fully established that it is a cheap power, but the Canadian manufacturer has not so far become convinced of the durability of the Canadian gas fields. The writer is informed that in some parts of the Ontario Peninsula the gas deposits have not been of sufficient magnitude to guarantee a steady supply over a period of years. So in New Brunswick, it will possibly be necessary for us to develop and bottle up our wells until we have a guaranteed supply covering a period of many years. Then we can say to the manufacturing world, "Here is cheap power and certain power over a period of time."

The concession granted by the Legislature of New Brunswick to the New Brunswick Petroleum Company, Limited, covers ten thousand square miles of the Province. The selection of this large area was made under the direction of Prof. N. S. Shaler, and we believe we have covered all the gas and oil bearing strata in the Province. The work up to date has only developed a few square miles of this great petroliferous area. Neither the scientist nor the laymen expects or believes that natural gas and oil will be found under all this expanse of country, but we have every reason to think that having the oil and gas-bearing formation throughout our concession, we should at least have as large a percentage of oil and gas "pools" as have been discovered under like conditions and in like formation, both in America and Asia.

This work in New Brunswick has been done from the beginning along conservative lines. The doubting "Thomas's" in our own Province did all they could to discourage the project, and some of them took particular pains to advertise the scheme as one of the most chimerical. It did not matter to them that they had not contributed, and that the company carrying on the development were not asking the public to contribute; they simply could not allow this opportunity to pass to hit New Brunswick on the head. I fear that in the past the enemies of this magnificent Province have been more within than without, in-so-far as advertising our splendid possibilities has been concerned. We are glad to state that this order of things is gradually passing, and our own people are waking up to the opportunities they have been falling over for so many years.

MANGANESE-STEEL RAILS.*

By Sir Robert Hadfield.

In a paper on Iron Alloys, with Special Reference to Manganese Steel, read before this Institute at the International Engineering Congress in Chicago in 1893, the writer mentioned that, about 20 years ago, his firm in Sheffield produced railroad material, such as tires and axles, of forged and rolled manganese steel, thus showing that this product could be manipulated and worked up into the various required forms. The tires illustrated in the paper referred to above formed a particularly difficult class of work to produce in a special steel, but no special obstacles were met with. Although there was no difficulty at that time in making and producing manganese steel in various forms, forged, rolled

or pressed; nevertheless, on account of its higher expense, sufficient encouragement was not then obtained from the users to introduce these products on a large scale. There never has been any real difficulty in obtaining forged, rolled, or pressed manganese steel, provided the consumer was willing to pay the necessarily higher cost as compared with ordinary steel.

The matter was further pursued in the present decade: In 1904, a French manufacturer produced rolled manganese-steel rails of $7\frac{1}{2}$ kg. per meter.

Tests on these rails were so satisfactory that manganese-steel rails of heavy section, 100 lb. per yd., varying from 6 to 12 m. in length, were then produced in the same rolling mill.

A large number of these rails were rolled in 1907, and were supplied to the Metropolitan Electric Railway of Paris, and put to work, among other places, at the Bastille station in that city. These rails, after several years of service on severe curve work, have given great satisfaction. After three years' hard service, the actual wear was found to be not more than about $2\frac{1}{2}$ mm. It has been estimated that the rails will remain in service for six to seven years before being worn out, whereas ordinary steel rails wear out and have to be replaced in less than a year.

A plant for producing sound ingots under the system devised by the writer was described in a paper presented to the Institute at the February, 1913, meeting. No less than 90 per cent. of sound material is obtained from an alloy steel, which will therefore be seen to offer great advantages. Each 1 per cent. of expensive material saved means that much reduction in the cost of production. The consumer has now to pay for 15, 20, or even 30 per cent. of waste in special steels made in the ordinary way, whereas this waste can to a large extent be avoided. Moreover, better and more uniform quality of alloy steel can be obtained.

INTERCOLONIAL COAL CO.

The coal and coke output of the Intercolonial Co. last year was the smallest since 1899, and 37,267 smaller than that of 1912.

The company, as recently reorganized, held its annual meeting last week, but pursuing the policy of many years, no figures were made public beyond the year's output.

The output has been falling off for years as the result of the increased cost of production, and as a consequence the company has been losing money.

The output of coal and coke for the year ending 31st December, 1913, amounted to 198,590 tons, compared with 235,857 tons in 1912.—Journal of Commerce.

DOMINION STEEL.

The dividend on Dominion Steel has been passed. The directors of the company met on Wednesday, March 4, and after a lengthy session decided to pass the dividend on the common stock.

At the close of the meeting they gave out the following statement:

"In view of the depression in general trade conditions, and in the steel trade in particular, it is considered advisable to confine the dividend on the common stock of the corporation to the three per cent. already paid, and not to pay the usual dividend on the 1st April."

The suspension of dividends on the common stock will mean a saving of about \$1,225,000 a year; eleven quarterly distributions aggregating about \$3,370,000 have been paid on the common stock since dividends were inaugurated in July, 1911.

*Extracts from a paper presented at New York Meeting, A. I. M. E., February, 1914.

THE MILL AND METALLURGICAL PRACTICE OF THE NIPISSING MINING COMPANY, LIMITED*

By James Johnston, Cobalt, Ont.

Upon the completion and successful operation of a mill to treat high grade silver ores the Nipissing Mining Company, under the general management of Mr. R. B. Watson, commenced a series of investigations having as their object the possible successful treatment of low grade Cobalt silver ores by the cyanide process, with a view to the marketing of silver bullion only. Experimental tests were made on a large scale, in July, 1911, by Mr. G. H. Clevenger, who used for his experimentation an average mixture of Nipissing ores: a partial amalgamation followed by cyanide treatment gave an extraction ranging from 90 per cent. to 93 per cent. and this test was so encouraging as to warrant Mr. Charles Butters, the company's consulting metallurgist, in recommending that the new low grade ore mill then under contemplation should be a cyanide, instead of a concentrating, mill. The cost of a cyanide mill with a capacity to treat 200 tons per day was estimated at about \$250,000, and it was also estimated that with such a mill it would be possible to obtain a 90 per cent. extraction at a working cost of \$3 per ton of ore treated.

This decision respecting the type of mill and process was arrived at after comparing concentration, which involved the shipment of concentrates to a smelter, with cyanidation, which produced metallic silver bullion, 999 fine, as the final product.

The following table shows the comparisons made:

Comparison of Mills Treating 200 Tons per Day.

Assay of ore	30.99 oz. commercial		
	1.10 oz. correction on pulp		
	<hr/>		
	32.09 oz. corrected assay		
Concentration mill to give an 80 per cent. extraction.		Cyanide mill to give a 90 per cent. extraction.	
Approximate cost	\$160,000.00.	Approximate cost	\$250,000.00.
80 per cent. x 32.09 oz.=25.67 oz. at 52c.=	\$13.35	90 per cent. x 32.09 oz.=28.88 at 52 c.	
Working costs	\$1.25	plus 3-10 c. increase price in marketing=	\$15.16
Marketing concentrates 10 per cent.	1.33	Working cost=	\$3.00
Difference between corrected and commercial assay on concentrates= 2 per cent.	0.27	Express on bullion, \$3.50 per cwt.=23c.	
	2.85	per oz. on 28.88 oz.=	0.07
	<hr/>		3.07
Profits per ton	\$10.50	Profits per ton	\$12.09
Profits per ton from cyanide mill			\$12.09
Profits per ton from concentration mill			10.50
	<hr/>		<hr/>
Profits in favor of cyanide mill			\$1.59 per ton ore treated.

Thus it will be seen that a cyanide mill, after having treated 56,600 tons (283 days' run), would have reimbursed the company for the extra \$90,000.00 required for its construction, provided it were possible to obtain the above results.

The results that are now being obtained in the cyanide mill are as follows:

Cost of construction	\$254,839.52
Working costs less than	\$3.00 per ton
Extraction on 26 oz. ore	92% to 93%
Tonnage treated per day	244

The above figures prove conclusively that the results obtained in the preliminary experiments have been more than borne out in actual practice, thus fully justifying the adoption of this type of treatment.

The cyanide mill has an additional advantage over

the concentrator in that it is able to get an extraction of over 90 per cent. on the arsenic-antimony-silver combinations and on the decomposed silver minerals found in some veins, on which concentrators can make only a poor saving.

During the construction of the mill experimental work was continued with a view to simplifying and bettering the process as it was then known, and also to more fully determine methods for overcoming the difficulties that others had experienced in their unsuccessful attempts to make such ores amenable to an all-cyanide treatment. Some of the results obtained during this time have been ably recorded by Mr. J. J. Denny in an article on "Desulphurizing Silver Ores at Cobalt," published in the Mining and Scientific Press, under date of September 27th, 1913; and in an article on "Aluminum Dust Precipitation" in the issue of the Engineering and Mining Journal of May 10th, 1913, Mr. E. M. Hamilton fully records the difficulties experienced elsewhere by the fouling of the cyanide solution where zinc dust is used as a precipitant and the conclusion which led to the adoption of aluminum dust as the precipitant in this mill.

A mill, with a proposed capacity of 200 tons per day was designed by Mr. Butters and the writer. Provision was made in the plan so that any change could be made during construction, should the results of the further

experimental work which Mr. Butters had suggested indicate that everything could be treated by an all-cyanide process. The experience gained from these tests resulted in modifications of the plans and flow sheet before erection was completed, to enable aluminum dust precipitation and the desulphurizing process to be introduced.

A synopsis of the mill process is as follows:

Crushing the ore to 3 in. in gyratory crushers before sending it to the washing plant.

Hand picking and jiggling of the high grade ore in the washing plant, the product from which is then sent to the high grade ore mill.

Crushing the discards from the washing plant (known as low grade ore) to 1½ in. mesh and sending them to the battery.

*Extracts from paper presented at Annual Meeting, C. M. I., Montreal, March 4, 1914.

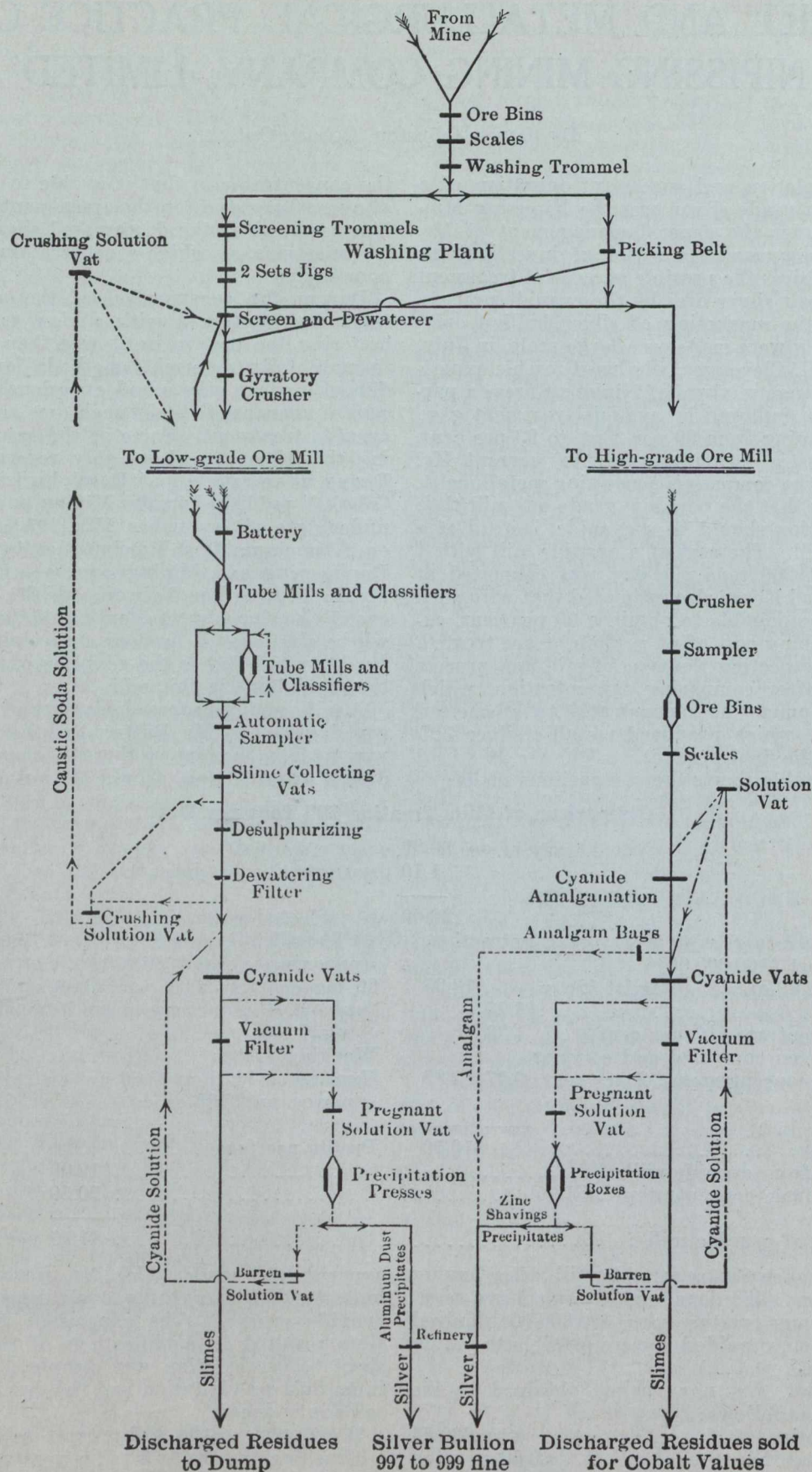


Fig. 1—Flow Sheet of Nipissing Mining Co.'s Mills

Crushing the low grade ore in the battery and in tube mills in a caustic soda solution, forming an all-slime product.

Collecting the slimes and desulphurizing them in tube mill and tanks.

Dewatering the slimes and transferring them to tanks for cyanide treatment.

Filtering the slimes and discharging them to waste dump. Precipitation of the cyanide solution, coming from the slime treatment tanks and the filter, by alum-

inum dust. The aluminum dust precipitate is taken to the refinery and there melted and refined to silver bullion of 997-999 fineness. The details are on the flow sheet and plans.

Construction.

The mill site is practically on the highest point of the Nipissing Hill and is so located that easy tram line

communication can be made between any point on the company's property and the mill; it also allows ample dump capacity below the mill for residues.

Excavations.—These were started in November, 1911, and the following data show the cost for soil and rock work. The figures given are fair averages, other parts of the same class of work on other levels costing a little more or less.

Cost of Excavations.

Soil work on tank floor level containing 2,404 cu. yd.

Labor	\$1,369.00
Sundry supplies	59.76
Teaming	6.03
Blacksmith's shop	17.60

\$1,452.39 = \$0.604 per cu. yd.

Rock work on same floor, containing 3,144 cu. yd.

Labor	\$5,539.00
Sundry supplies	123.52
Explosives	279.41
Blacksmith's shop	102.75
Air drills	1,196.32
Hauling rock to dump	1,503.68
Lumber	25.50

\$8,770.18 = \$2.79 per cu. yd.

Concrete Foundations.—The walls for buildings and machinery foundations are of concrete. The crushing and mixing plant for concrete making was placed on a level above the uppermost floor, from which the material was transferred by chutes and cars into the various foundation forms, the necessary machinery being driven by compressed air. A mixture of 1 of cement, 3 of sand, and 5 of stone (together with the

addition of all the large stone the concrete would hold as it lay in place in the forms), was used throughout the foundations, with the exception of the battery, tube mill, and other machinery foundations which were to be subjected to much vibration. In these cases the upper one or two feet of the foundation were strengthened by the addition of cement.

The following are representative costs:

Cost of Foundations and Walls.

Battery foundation and walls, for the building and ore bins,

Battery block =	848 cu. yds. concrete
Building and walls =	349 cu. yds. concrete

Total 1195 cu. yds.; used 945 bbls. cement

Labor	\$2,669.48
Supplies	3,735.33
Lumber	246.57
Carpenter shop labor	790.86
Machine shop labor	87.78
Teaming	139.34
Fuel	12.85
Air for operating machinery	400.00

\$8,082.21 = \$6.76 per cu. yd.

Retaining walls and sundry small walls and foundation on tank floor lead:

434 cu. yd. used 485 barrels cement.

Labor	\$1,645.57
Supplies	2,152.52
Lumber	337.76
Carpenter shop labor	1,180.05
Machine shop labor	26.09
Teaming	26.33
Fuel	12.85
Air for operating machinery	300.00

\$5,681.17 = \$13.09 per cu. yd.

Cement was shipped to the mill in bags of which four were equivalent to one barrel, the total consumption being 3,355 barrels at an average cost of \$2.06 per barrel. Only 65% of the empty bags were fit to be returned to the cement company, the balance having been destroyed in shipment and handling.

The various forms for concrete foundations, etc., around the mill made use of 26,339 ft. b.m. of 1" boarding and 20,771 ft. b.m. of other sizes of lumber, part of which, when taken down, was used for other purposes.

The mill building is constructed with wood framing covered with 1" boarding, building paper and corrugated iron, so as to make a warm building for winter service. There were used 398,601 ft. b.m. lumber in its construction; of this 148,250 ft. b.m. was 1" boarding. The total quantity of lumber employed in the whole of the construction was 1,199,206 ft. b.m., the value of which was \$23,731.33.

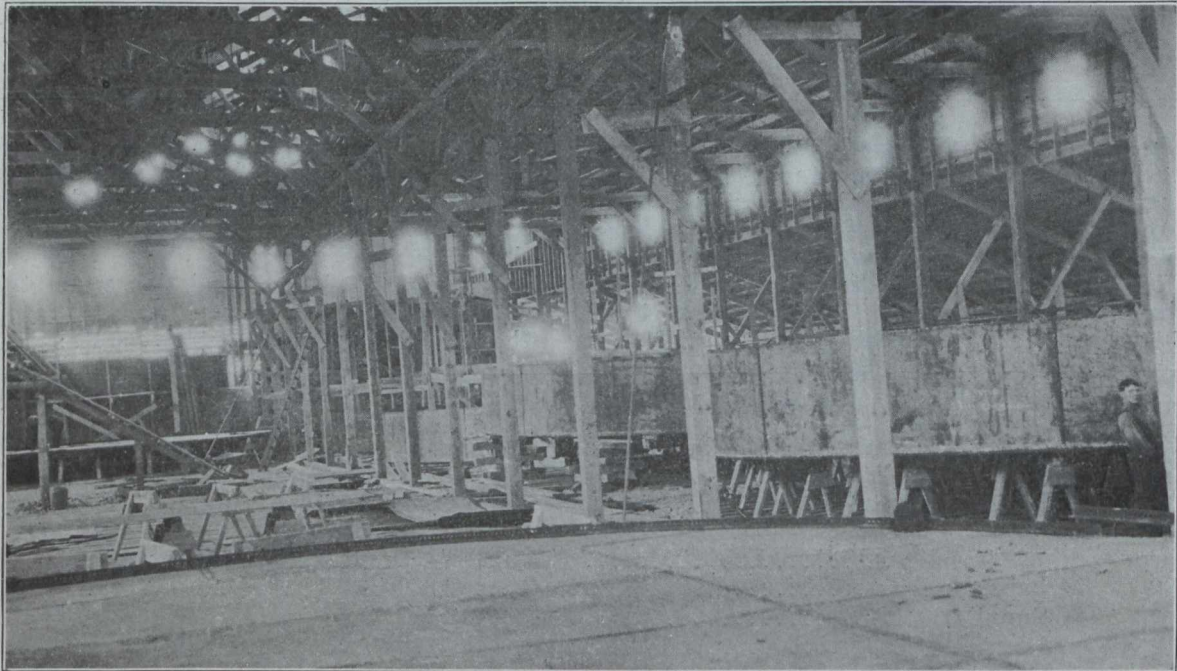
Cost of Construction of the Low Grade Ore Mill (Crushing and Cyanide Section).

The following statements cover the complete cost of the construction of the mill. These accounts were closed about three months after the mill went into operation, so that all the adjustments made necessary

Tube mills and classifiers	23,223.80
Tube mills proportion electrical equipment.	12,091.02
Slime treatment and storages	31,519.84
Slime treatment proportion electrical equipment.	4,477.26
Cyanide filter plant	14,154.92
Cyanide filter, proportion electrical equipment.	3,040.71
Piping, pumps, etc.	12,886.19
Precipitation.	9,989.23
Precipitation, proportion electrical equipment.	239.42
Heating plant	12,333.70
Water service	5,288.57
Water service, proportion electrical equipment.	1,028.13
	<hr/>
	\$241,666.89

To this cost was added later the installation of the intermediate filtering and desulphurizing equipment, not included in original estimate. 13,172.63

Total cost of mill\$254,839.52



A View of Nipissing Cyanide Plant During Construction

after the starting of the mill, in which some new departures in metallurgy were being exploited, are included in these total costs.

The original estimated cost of this section of the mill as enumerated in the following list of departments was made in October, 1911, and totalled \$250,000.00.

Departments.	Cost to Jan. 31st, 1913
Store and office building	\$725.65
Proportion office and supervision during construction.	6,652.97
Excavations.	29,728.30
Foundations.	20,159.39
Buildings over mill	24,618.99
Battery equipment	24,241.42
Battery equipment proportion electrical equipment.	5,267.38

Other mill construction work undertaken at the same time and which would have been common, either to a cyanide mill or a concentrator, is as follows:

Departments.	Cost to Jan. 31st, 1913
Tram Lines, Washing Plant, Etc. Section.	
Crushing, sorting and jiggling	\$25,836.64
Crushing proportion electrical equipment..	2,274.55
Meyer crushing section	5,945.98
Tramlines aerial	18,299.05
Tramlines Kendall	6,499.61
Fixing roads	4,386.02
Workshops.	4,813.14
Proportion office and supervision during construction.	1,756.26
	<hr/>
Total cost	\$69,811.25

Ore Delivery.

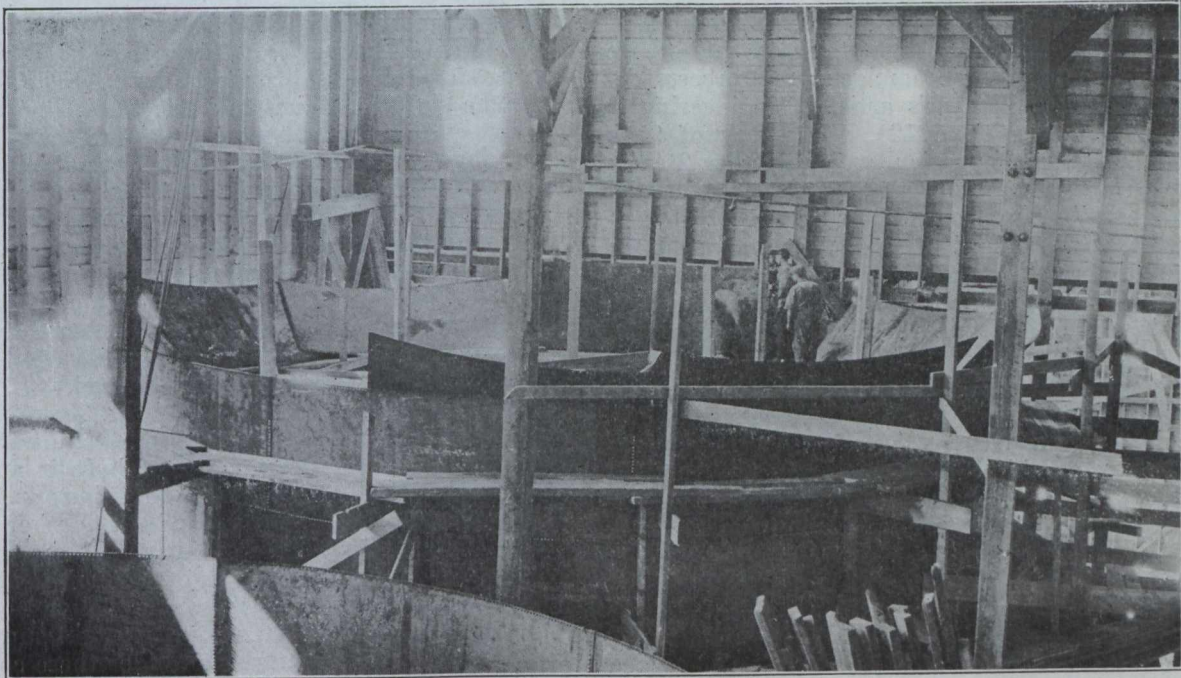
All the ore from the various workings, after it has been crushed to 3" cubes in gyratory crushers, is delivered into the ore bins of the washing plant. The ore from the northwest side of Cobalt Lake is conveyed to the plant by a Bleichert aerial tramway 3,560 ft. long having a rise from the loading to the unloading station of 172 ft.; the longest span is 1,080 ft. which is the distance across Cobalt Lake. The buckets travel at the rate of 500 ft. per minute and the tramline delivers 110 buckets of 6 cu. ft. capacity each, equivalent to about 35 tons per hour, and requiring 10 h.p. to operate the line. The ore from the workings of the property situated on the mill side of Cobalt Lake is delivered to the mill by surface tramlines.

Washing Plant.

The ore bins, of which there are four, each of 80 tons capacity, are so arranged that one class, or several classes, of ore may be sent to be milled as conditions require. The ore from the bins is loaded into a 20 cu. ft. car and passed over a Fairbanks registering scale

screen the first portion going to the jigs is collected. The undersize from this last trommel is conveyed to another trommel, 36" in diameter and 9 ft. long, which makes 20 revolutions per minute; the screen has round holes of 3 millimeters in diameter and the discards, or oversize, from this last screen go to two other jigs which also are fitted with rolled slot wire cloth screens, the width of the slot here being 0.040"; and at this point the second jig portion of the high grade ore is obtained.

The undersize from this last trommel, together with the discards from the four jigs is elevated to a dewatered trommel, which is 30" in diameter and 6 ft. long and which has a wire cloth screen with 3 meshes to the inch. From this dewatered trommel the oversize joins that portion of the ore, coming from the picking belt, which is destined for the battery bins, while the undersize is sent direct to join the pulp from the battery before it goes into the tube mills. This portion of the ore, amounting to about 10% to 15%, represents the original fines as they come from the mine and also the fines which may have been produced in the prelim-



Construction of One of the Vats, Nipissing Cyanide Plant

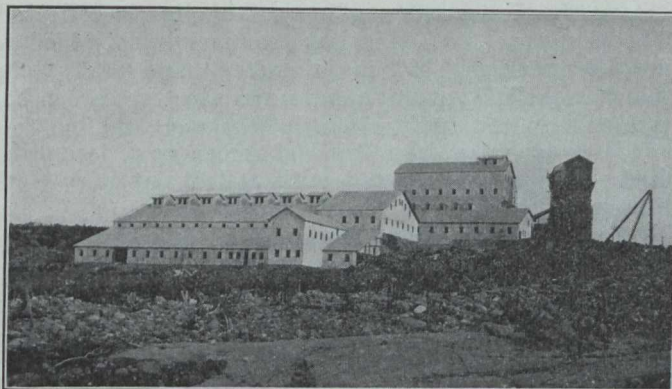
which makes a record of the total weight of ore delivered to the mill. The ore is then fed through a long washing trommel, 40" in diameter and 10 ft. in length, which makes 14 revolutions per minute; the screen portion of this trommel is perforated with holes 1½" in diameter. The oversize, or coarse ore, from the screen falls on a picking belt 30" wide from which the hand picked portion of the high grade ore is sorted, the low grade portion being conveyed by the belt and delivered to a crusher by which it is broken to 1½" mesh before passing into the battery ore bins. The undersize, or ore which falls through the perforations of the first trommel, goes to a washing trommel, 30" in diameter and 6 ft. long, which makes 20 revolutions per minute; this washing trommel has a screen with ½" round holes, the over size of which goes to two jigs which are fitted with rolled slot wire cloth screens, the width of the slots being 0.115". From this

inary stages of crushing. The bi-passing of these fines around the stamp batteries has very successfully and materially assisted the battery work.

The water used in the washing plant is continually circulated by a centrifugal slime pump 4" in diameter. A few pounds of lime are added to the water daily to assist the settlement of slimes, which are collected in two tanks, each of which is 12 feet in height and whence, after settlement, the slimes flow to the tube mill pulp storage tanks. The power required to operate this plant for 9 hours is 35 k.w. during which time from 300 to 350 tons are handled.

This part of the practice followed very successfully the lines of previous sorting and jigging which had been worked out by the company, and it owes much of its success to Mr. H. A. Kee and his experience in this class of work.

The high grade ore which is sorted out in this part of



Nipissing Low-Grade Plant



Nipissing High-Grade Plant

the mill varies considerably in grade and in quantity, but the average figure taken on the basis of each 100 tons treated is as follows:

Hand picked ore	0.662 tons	Aver. value	2803 oz. per ton
First jigs	0.265 tons	Aver. value	2496 oz. per ton
Second jigs	0.138 tons	Aver. value	2200 oz. per ton
	<u>1.065 tons</u>		<u>2648.47 oz.</u>

This ore is then sent to the high grade ore mill where it is treated by the cyanide amalgamation process described in Mr. R. B. Watson's article (*Engineering & Mining Journal*, Dec. 7th, 1912), a recovery of 97% being obtained by amalgamation, and a further 2% by cyaniding, or a total recovery of 99% from ore carrying 2,648.47 oz. silver per ton. The residues, which contain from 8% to 9% of cobalt, are afterwards sold for the value of the cobalt, and 85% of the silver contents, so that from an ore of the above original head value, there are about 4 oz. only of the silver values not paid for.

The ore after being crushed to 1½" in a No. 4 gyratory crusher is transferred on a 20" belt conveyor into the mill building; then elevated by a 16" bucket elevator into the battery ore bin, which has a capacity of 780 tons.

The feeders are of the suspended Nelson type.

(To be continued.)

GOWGANDA APEX.

The Financial Times of Montreal says:

Members of the Gowganda Apex Underwriters Syndicate are being asked by Messrs. Day, Ferguson & O'Sullivan, solicitors of Toronto, to surrender their memberships in exchange for a corresponding block of stock in the Silver Mines of Canada, Ltd.—each member getting the same number of shares as he was to have received in the Gowganda Apex Co. The offer is on behalf of Mr. Dowling, the original holder of both groups of properties. The letter says in part:

"Like all the companies and syndicates seeking for money to develop Gowganda properties, the syndicate was a financial failure, and there were not enough memberships sold to pay for the advertising and expenses. However, Mr. Dowling, who was the original purchaser of the properties, and had consented to turn his options into a syndicate and allow the proceeds of sales of interests to be used in the development of the property, felt that by reason of other persons having become interested, he should continue the development work, and he personally put up the money required to complete the purchase and to do the necessary as-

essment work. He owns about ninety per cent. of the entire syndicate memberships. The result of the development work was unsatisfactory, and there was not sufficient silver found to justify a person spending more money on the properties.

"The Silver Mines of Canada, Ltd., is a company owning a large number of claims in the Gowganda mining camp, which claims are at Bloom Lake, and include the well-known Donaldson mines, on which extensive development has been done. The company has some eighteen claims and has carried on extensive and costly development work for some years, and now about fourteen claims are ready for patent. He has proposed to this company to turn over to it the old claims of the Apex Syndicate if the directors feel like putting up the money to take out patents, and he has instructed us, out of the stock owned by him in Silver Mines of Canada, Ltd., to issue to each of the members of the Gowganda Apex Syndicate the same number of fully paid-up shares as they would have got had the Gowganda Apex Company been formed.

"Native silver has been found in seven different veins on the surface of these properties, while about 20 other veins assay silver. One shaft is now being sunk to the 100 ft. level, when driftings in different directions will probably be made. Another shaft is down 30 ft., and on different parts of the properties there are eight or ten test pits of varying depths, some 15 ft. deep, and some of these show silver. Hitherto it has cost as much as \$40 a ton to freight supplies and machinery to the property, and under these conditions, development work has been impossible, but the near approach of the Government railway, and the general improvement in mining conditions in the locality gives a much better outlook to the company."

HILLCREST COLLIERIES, LTD.

Net profits of the Hillcrest Collieries, Ltd., in 1913, according to the statement presented at the annual meeting of shareholders this week, showed an increase of approximately 25 per cent., while surplus after all charges and preferred dividend fell just a little short of making a 100 per cent. increase.

With rentals of buildings and other revenue added to net profits from operation after providing for all expenses and depreciation, the company last year had a net revenue of \$133,823. After deducting bond and other interest and preferred stock dividend, the balance remaining as surplus for the year was \$61,601, equal to 6.16 per cent. on the \$1,000,000 common stock, against \$32,660, or 3.26 per cent. on the common stock in 1912.

PERSONAL AND GENERAL

Mr. Frank Loring is in England.

Mr. R. B. Lamb has left Toronto on a trip to England.

Mr. R. W. Brock, Dominion Deputy Minister of Mines, has been on a short holiday trip to Bermuda.

Mr. G. G. Gibbins has returned from Vancouver and is examining properties in Eastern Ontario.

Mr. J. B. Cooper, superintendent of the Calumet and Hecla Mining Co.'s smelters at Hubbel, Mich., died on Friday, Feb. 27, 1914.

Mr. F. R. Wolfle, of Spokane, Washington, manager of the Florence Mining Co., was at the company's mine in Ainsworth mining division, B.C., last month.

Dr. F. H. Hatch was invited to attend the annual meeting of the Canadian Mining Institute, but was unable to do so owing to his hurried return to London.

Mr. K. B. Carruthers, superintendent of the Consolidated Mining and Smelting Co.'s Molly Gibson silver-lead mine, in Nelson mining division, has returned to British Columbia from a trip East.

Mr. A. A. Cole, Cobalt, has been elected a vice-president of the Canadian Mining Institute to fill the vacancy caused by Mr. G. G. S. Lindsey's election to the presidency.

Prof. Milnor Roberts, dean of the College of Mining, University of Washington, Seattle, Washington, went to Vancouver last month to attend the meeting of the Western Branch of the Canadian Mining Institute.

Mr. A. W. Davis, of the Consolidated Mining and Smelting Co.'s mining engineering staff, left Kootenay district, British Columbia, about the middle of February on a vacation which he planned to spend in Eastern Canada.

Mr. J. W. Boyle, general manager of the Canadian Klondike Mining Co., was at Woodstock last month, his mother having recently died there. He will return to the Yukon in time for the coming season's placer-gold mining operations in that part of Canada.

Mr. O. B. Smith, superintendent of mines for the Granby Consolidated Co., last month went from Granby bay to the company's Mamie mine, near Hadley, Prince of Wales island, Southeast Alaska, before returning to his headquarters in Vancouver, B.C.

Dr. F. H. Hatch, president-elect of the Institution of Mining and Metallurgy, London, and consulting engineer for the Kirkland Lake Exploration Co., spent ten days at the Tough-Oakes mine, Kirkland Lake, and has returned to London.

Mr. E. H. Williams, for seven years assayer at the 40 stamp mill at Hedley, Similkameen, B.C., has been stricken with blindness. Several months ago he went to England for expert treatment, but his journey was of no avail, for a recent advice received at Hedley stated that he had quite lost his sight.

Mr. Thos. McGuckie, formerly general superintendent for the Western Fuel Co., Nanaimo, B.C., has received from the headquarters in England of the St. John Ambulance Association, a communication expressing appreciation of the effective and valuable work he has done in furthering first-aid work among miners who were employed in coal mines in the neighborhood of Nanaimo.

Mr. Thos. Russell, for years mine manager for the New Vancouver Coal and Land Co., operating the collieries in Nanaimo district, Vancouver island, British Columbia, now owned by the Western Fuel Co., and afterward superintendent of the Extension colliery of the Canadian Collieries (Dunsmuir), Ltd., was lately appointed superintendent of the Crow's Nest Pass Coal Co.'s Michel colliery in Southeast Kootenay, B.C.

Mr. J. Street, of Whitewater, B.C., mine superintendent for the John L. Retallack & Co. mining syndicate, was in Kaslo in the latter part of February, expecting to have to spend several weeks in the local hospital.

The H. W. Johns-Manville Co. announce that the necessity for larger space and better facilities to handle their increased business, compelled the Indianapolis, Ind., and Louisville, Ky., branches to seek larger quarters. The new address of the Indianapolis branch is 408-410 North Capitol Ave., that of the Louisville branch, 659-661 South Fourth Ave.

Canadian Allis-Chalmers, Ltd., Toronto, have been appointed exclusive agents for Canada and Newfoundland of the Avery automatic scales. The parent factory at Birmingham, England, was established almost 200 years ago, and is without doubt the oldest and largest scale company in the world, comprising factories in England employing 5,000, and another at North Milwaukee, Wis.

Rock and Power Machinery, Ltd., has been awarded contracts by the Point Anne Quarries for a special Kennedy revolving screen, by the Ontario Stone Corporation for a No. 6 Kennedy crusher elevator, screens, etc., by the Gravenhurst Crushed Granite Co. for a complete rock crushing plant, including two No. 6 and one No. 8 Kennedy gyratory crushers, and a 75 ft. Kennedy elevator; also rock drills and F J A B steel.

COBALT SHIPMENTS.

(Cobalt Nugget.)

The shipments from the Cobalt mines for the week ending March 6th were, in pounds:

	High.	Low.	Total.
Hudson Bay	148,350		148,350
Dom. Red.		176,400	176,400
Seneca-Superior.	61,300		61,300
Penn-Canadian.		40,000	40,000
Crown Reserve	40,000		40,000
Coniagas.	168,760		168,750
Cobalt Townsite	71,890		71,890
Trethewey.	44,230	40,400	84,630
La Rose	86,910		86,910
	621,430	256,800	878,230

The bullion record for the week ending March 6th is:

	Bars.	Oz.	Value.
Nipissing.	80	96,206.63	\$65,318.81
Buffalo.	43	44,424.35	26,000.00
Kerr Lake	17	14,737.00	7,015.52
O'Brien.	10	9,138.00	5,254.57
	150	164,505.98	\$103,588.90

The bullion shipments for the year to date are:

	Oz.	Value.
Nipissing.	1,082,546.81	\$633,137.67
Dom. Red	149,292.00	87,777.24
Buffalo.	188,450.35	109,500.00
Crown Reserve	94,024.00	54,323.25
O'Brien.	46,274.30	26,195.46
Kerr Lake	33,313.75	16,909.74
Foster Ls. Co.	2,187.25	1,141.44
Penn. Can.	3,416.50	1,771.52
Casey Cobalt	2,893.00	1,484.00
	1,602,397.96	\$932,240.32

SPECIAL CORRESPONDENCE

KIRKLAND LAKE, SWASTIKA AND PORCUPINE

Payments Made on Properties.

On behalf of the Kirkland Lake Proprietary first payments have now been made on both the Burnside and the Teck-Hughes at Kirkland Lake. Substantial payments had already been made on the Tough-Oakes.

Of much importance to the camp was the visit of Dr. F. H. Hatch, president-elect of the Institution of Mining and Metallurgy. Dr. Hatch arrived in Swastika on February 23rd and stayed for ten days at the Tough-Oakes mine. He inspected all the more prominent mines and prospects before he returned south. Dr. Hatch is consulting engineer for the Kirkland Lake Exploration Company, an English syndicate holding some claims in the new gold camp.

At the Tough-Oakes gold mine development in the shaft below the 200 ft. level and in the No. 3 shaft is showing up extremely well.

Teck-Hughes.—The ore body struck on the Teck-Hughes appears to be quite promising. It was found in a crosscut on the 75 ft. level, 70 ft. from the drift on the No. 3 vein. The new vein consists of about four or five in. of high grade ore. For about two ft. on either side of the vein the rock will probably make milling ore. Two ore shoots on the No. 3 vein were quite high grade.

Dome.—At the Dome the No. 2 shaft is being sunk from the fifth to the seventh level, giving a depth of 575 ft. The work, which has been commenced from the 425 ft. level, should be completed in three months' time. At the 425 ft. level much ore has been opened up, but upper levels have not been much developed yet. But by the time the shaft is sunk to the new low level the fifth level will be in good shape for stoping for the mill.

It is not expected that the addition to the mill will be running before the middle of April. The February output from the Dome will show a falling off owing to the temporary break down of the power available.

Hollinger.—The gross profits from the Hollinger mine for the four weekly period ending Jan. 28 showed \$101,663, as compared with \$114,249 in the previous period. The surplus now stands at \$700,126. Over 1,000 ft. of diamond drilling located two new ore bodies. These new ore bodies were on the 425 ft. levels and 200 ft. levels respectively. General development amounted to 817 ft. The mill ran 96 per cent. of possible running time, treating 12,813 tons, of which 256 tons were treated for the Acme gold mines. The average value of Hollinger ore treated was \$13.75 per ton, approximate extraction 96.33 per cent.

McIntyre.—The McIntyre Company is now driving a lengthy crosscut from the 600 ft. level of the Pearl Lake mine. Arrangements have been completed whereby in return for work to be done underground the McIntyre has the use of the workings of the Pearl Lake. About 300 ft. of crosscutting has been completed, and another 800 ft. will connect with the shafts of the McIntyre south of the lake. Thirty ft. of quartz and mineralized schist has recently been cut in the working near the contact between the porphyry and the basalt. The values are stated to be about \$8 a ton. From the 600 ft. level 200 ft. of drifting has been done

on No. 5 vein. No. 5 vein on the McIntyre at the 600 ft. level shows 8 ft. of ore. The vein at No. 4 shaft has been opened up for 110 ft., and in the face shows six and a half ft. of \$18.00 ore.

Dome Lake.—Some remarkable samples have been taken from the ore body on the Dome Lake mine at Porcupine at the 115 ft. level, about 180 ft. from the main shaft. While the vein is narrow, it shows very rich in gold. The vein matter also is heavy in sulphides. This is believed to be a new ore body.

COBALT, GOWGANDA, AND SOUTH LORRAIN

Cobalt Lake.—The annual report of the Cobalt Lake Mining Co. shows a falling off in net returns from ore and a substantial increase in ore reserves. This increase is obtained, as President Sir Henry Pellatt explains, by the fact that now the ore under the lake will be available, since the authorities have permitted the draining of the lake. On Dec. 31, 1912, the profit and loss account showed a credit balance of \$425,947, this year the credit balance amounts to \$407,460. The cash on deposit was \$60,143, and the amount due from smelters at the last of the year was estimated at \$109,795. Ore reserves are shown by the engineer's report as 4,796,940 oz, which is an increase of 2,661,900 oz. over the statement of last year. Dividends aggregating ten and one-half per cent., or \$315,000, have been paid during the year. The net returns from ore for the year show a decrease of \$77,628. This was owing to the fact that extensive improvements have been made at the mine, necessitating the milling of ore entirely from the dumps for a period of two months. The general statement at the mine reads:

Silver in ore shipped to smelter	973,676.09 oz.
Allowed on smelter contract	49,497.70 oz.
<hr/>	
Total silver paid for	924,178.39 oz.
Estimated value of silver recovered at mine	\$570,574.18
Cost of producing	248,819.58
<hr/>	
Profit at mine	\$321,754.60
Estimated cost of marketing silver	52,303.86
<hr/>	
Estimated profit at smelter	\$269,450.74

In relation to the method by which Mr. Gordon estimates his ore reserves, it is interesting to note that he says:

"On Dec. 23rd, 1913, Mr. T. E. Godson, the Mining Commissioner, made the award in the Cobalt Lake draining question granting the company permission to drain the lake. This work will be commenced as soon as the final agreements between the different companies concerned and ourselves are completed, namely, those companies that have property adjacent to the lake or that draw water therefrom. The order so granted will allow us upon the completion of the draining to recover the ore that now lies in what was called our safety wall, which is a partition of 40 ft. and upwards between our underground workings and the rock bottom of the lake, and I have therefore included this partition in my estimates of ore reserve this year, which in past years I omitted."

Mr. M. B. R. Gordon places ore reserves at 169,601 tons, containing 4,796,940 oz. Of this amount 6,496

tons, containing 129,920 oz., is ore broken in stopes.

As to milling, it is stated that the extraction has been raised to 81.3 per cent., as against 79.3 per cent. for 1912. During the present year it is proposed to increase the tonnage treated, bringing it up 175 tons over per day. This will make possible the treatment of lower grades of ore.

Timiskaming.—Owing to the fact that there has been a very brisk fight for the control of the Timiskaming Mining Co., the annual report just published is of especial interest. The report showed a very considerable falling off both in production and profits. The total production from high grade ore by hand sorting was only 255,930 oz., as compared with 497,873 oz. in 1912. The grade, however, maintained its high average, the 554 tons shipped averaging 4,619 oz. a ton. The total production from the mine since the commencement of operations to the end of 1913 is 7,103,362 oz., which was shipped to the smelters in 5,251 tons of ore, averaging 1,341 oz. per ton.

As to mill ore the mill treated 32,307 tons of eighteen and half oz. ore, as compared with 40,056 tons, of 22.6 oz. ore during 1912. The falling off was due to the fact that the dump reserves were depleted during the previous year and there was insufficient ore available underground to make up the deficiency. The total production amounted to 483,796 oz., contained 516.7 tons of concentrates of an average assay of 936.3 per ton.

Owing to the narrow profits the management decided not to attempt to pay any more dividends, but to conserve all resources to opening up more ore. The report also states that the North Dome had been closed down to await better times, although there are big bodies of low grade ore and the extension of the Dome ore bodies had been discovered.

As to the possibilities at Timiskaming, Mr. Norman Fisher states: "That all the veins productive in the Keewatin formation became impoverished on entering the underlying diabase. Acting on certain deductions, work was carried out to tap new deposits in various likely places. Fortunately a good deal of success attended these efforts, even though most of those discovered were more or less erratic in occurrence and rather limited in extent. They were of much importance and provided the greater proportion of our production last year. Quite a little prospecting work was and is still being carried on in the Keewatin formation at the upper levels, but in no instance did this meet with reward. An option has, however, been taken on an adjoining property, the Duchess, where a crosscut is being run from the 250 ft. level, with the hope of picking up the extension of the Timiskaming ore bodies. The work in the diabase has resulted in some very promising discoveries."

The ore bodies while rich were, however, quite limited in extent.

Mr. Fisher says: "Owing to the changed conditions of the new occurrences in the diabase, the same blind though systematic crosscutting on preconceived lines which was carried out so extensively in the Keewatin must be repeated in the diabase before it can be safely eliminated as unproductive."

Trethewey.—The annual report of the Trethewey mine showed that while ore is much leaner and profits per ton less, ore reserves had been maintained during the year, and dividends paid out of profits. The report shows that 619,427 oz. of silver were produced and 599,036 oz. shipped at a cost of \$6.65 a ton; 36,288 tons were produced at a net profit of \$3.70 per ton. The costs total and summary show that development

cost \$1.07 per ton, breaking and stoping \$2.28 per ton, milling \$1.46 per ton, general expenses \$.93, marketing ores \$0.90, prospecting, \$0.04, total \$6.68 per ton.

As to ore reserves, it is stated "that an increase of 2,766 tons was made in the reserves of broken ore in the mine, while the decrease in blocked ore was 601 tons. The reserves of ore in the surface dump were drawn upon to the extent of 3,409 tons during the year. The net change in the position of the ore reserves at the beginning and end of the year is a decrease of only 1,244 tons, showing that the balance between new ore developed and ore sent to the mill has been fairly well maintained.

Very little of production came from high grade ore. 93.82 per cent. came from concentrates, which had an average value of only 234.4 oz., while high grade made up only 4.46 per cent., and bullion 1.72 per cent. The ore reserves, which amount to 585,870 oz., average 19.6 oz. per ton.

The production of silver amounted to 619,427 oz., having gross value of \$365,565. The operating expenditures amounted to \$204,072, leaving a net revenue from operations of \$130,696, as compared with \$127,834 in 1912.

Dividends paid during the past year amounted to \$150,000, and after all provisions had been made the surplus carried forward was \$164,148.

In regard to the option taken on the West Beaver the Port Arthur silver prospect, it is stated, that operations have been of an encouraging nature. The sum expended to the end of the year amounted to \$3,757.

Hudson Bay.—The production of the Hudson Bay mine for January was 56,982 oz., which shows an increase of nearly 7,000 oz. Greater production from the veins on the lower levels accounted for the increase. The total ore concentrated during January amounted to 1,971 tons, with an average assay to the mill of 25 oz. The tailing ran 2.8 oz., giving an average percentage of extraction of 89 per cent.

Nipissing.—The Nipissing shipped fifteen and a half tons of silver from the high grade mill on Feb. 25th. This was contained in 381 bars, containing 452,335 oz. silver, valued at \$260,681. This constitutes a record for the Cobalt camp, and, it is believed, for the Dominion. The large shipment was owing to the fact that the previous month the annual clean-up had taken place in the high grade plant, and it was not possible to treat much ore. It had thus accumulated.

Beaver.—The new big hoist has at last arrived at the Beaver, and is being installed. It will be able to hoist from a depth of 2,000 ft. Owing to the fact that the delivery of the hoist has been delayed, no work has been done below the 675 ft. level for some time, but it will now be proceeded with at once. The shaft is down to the 800 ft. level, and crosscutting has commenced at that depth, but the ore body had not been reached when it was found necessary to stop deep mining until a bigger hoist was obtained.

Peterson Lake.—The discovery at Peterson Lake holds out quite well. Seven ft. from the point where the high grade was first struck, the two veins have run apart and will have to be followed in separate drifts. This is now being done. The veins were always distinct. The ore in both drifts is still looking good. It contains a higher percentage of nickel than Seneca Superior ore. The two veins aggregate about seven in. of high grade ore and assays point to the fact that there will be good milling value in the wall rock. Several tons of high grade have already been sacked and a sorting plant is now being installed at the old Kerry shaft.

BRITISH COLUMBIA

The opinion seems to be general that the current year will be an active one in mining in British Columbia, and in this connection several Provincial legislators have made optimistic speeches that have been pleasant to hear and reports of which have made good reading. The satisfactory part of the position is that while sometimes a speaker could easily be cornered if he were required to give specific reasons for "the faith that is in him," those familiar with details of mining work in progress or being prepared for are possessed of much information that should be regarded as fully justifying a favorable view of the outlook for mining in this Province in 1914, of course, providing that no unforeseen preventive conditions shall be experienced to prove unusual obstacles to progress.

A rapid survey of the situation will indicate in a general way grounds for confidence in the near future of the mining industry of British Columbia. Glancing at the districts in the order in which they stand in official publications, the following is a brief summary:

Cariboo placer-gold mines have promise of at least an ordinary supply of water for hydraulicking purposes. In Cassiar district placer-mining should be extended, for there has been much activity, even during the winter, in parts of Atlin mining division; preparation was made last season for operations on several streams in Omineca division; and in Stikine and Liard divisions, especially about Dease lake, placer-mining is again receiving attention.

Lode mining in the northern country is gradually being developed, in small degree in Atlin division, with promising results in Portland Canal camps, with a prospect of early shipment of ore from Moresby island of the Queen Charlotte group, ore production in active progress about Hazelton, and practical completion of provision for important mining and smelting operations at Granby bay, Observatory inlet.

In East Kootenay, coal mining conditions are favorable to last year's record results being equalled, if not exceeded; and lode mining may also be expected to be maintained on at least the 1913 scale, though a large output of ore from the Sullivan mines is probable and an improvement in the St. Eugene may be looked for.

Ainsworth mines are doing better as a whole than for a number of years; in Slocan division, at least a dozen mines are being worked and quite half that number, with excellent results and with assurance of still further improvement; mining in Nelson division is on a better footing now than for years, with 15 to 20 mines being worked and production being gradually increased; in Rossland camp there is full confidence that years of profitable production may be relied on, so favorable have been the results of deep development work during the last year; in Boundary district, the big copper mines have several years' ore supply in sight, and two or three small mines are now being worked to advantage; in Similkameen district, the Hedley Gold Mining Co. is spending \$200,000 to provide power for enlarged mining and milling operations, and the British Columbia Copper Co. is making financial provision for utilizing the large quantity of ore its exploration and development work of the last two years have demonstrated is available on Copper mountain; at both Kamloops and Lillooet there should be increased production, though not yet on a large scale; completion of construction of railway lines may be expected to greatly benefit coal mines in Nicola valley by giving them connection with new markets for their product; and on the lower coast, copper mining at the

Britannia mine, and a gradual recovery from the bad effects of last year's labor difficulties at Vancouver Island coal mines, will each add its quota to the sum total of progress that is regarded as reasonably certain.

Ainsworth and Slocan.

Ore Shipments.—Three mines in Ainsworth division have continued shipment of ore throughout the winter, these being the Consolidated Mining and Smelting Co.'s Highland and No. 1 mines, both having aerial tramway connection with the lake front near the town of Ainsworth, and the Bluebell, situated at Riondel, across Kootenay lake from Ainsworth. Totals for seven weeks to February 19 were as follows: Highland, 395 tons; No. 1, 977 tons; Bluebell, 923 tons. The Bluebell ships lead-silver concentrate, so the quantity shipped may be taken as having been the lead product of 8,000 to 9,000 tons of ore put through the concentrator. It has been the custom to save the zinc middling for later disposal. The other mines probably ship crude ore, although both have tramway connection with the Highland concentrator. The Silver Hoard, also in Ainsworth camp, has not sent out much ore during the latter part of the winter, only one lot, of 44 tons, having been received at the Trail smeltery during the period above mentioned. Receipts of Silver Hoard ore during 1913, however, totalled 1,287 tons; more development work done during the winter, and additions to mine equipment, together warrant the expectation of an enlarged output after winter disadvantages shall no longer be experienced. Other properties being worked include the Florence Mining Co.'s claims, a few miles north of Ainsworth; the Utica, about 18 miles east of Kaslo; and J. L. Retallack & Co.'s Whitewater group.

New Power Supply.—The Consolidated Co. has been putting in Pelton wheels and an electric generator, to be operated by water obtained from Cedar creek at an elevation of about 1,000 ft. above the Highland mill, where the current is generated to drive compressor and other machinery there. Air pipe lines from the mill to the Highland and No. 1 mines provide for supply of power for operating drills, etc., in those mines. The Taylor hydraulic compressor on Coffee creek will supply air for drilling on several properties on which the Consolidated Co. is doing development work under option of purchase.

The Black Bear group of mineral claims, situated near Sproule, a few miles east of Whitewater, has been bonded by Mr. J. J. Hennessy, of Spokane, Washington, for United States men, who intend commencing development work on this property as soon as the snow shall melt and supplies can be sent in.

The Eagle Lode Mining Co., of Spokane, has been doing development work on the Eureka group, about four miles from Sproule, and expects to make a shipping mine there.

On the Valdes Islands.

Valdes Island Copper Co.—For a number of years mineral claims situated on what is now known as the Valdes group of islands, lying between Vancouver island and the mainland of British Columbia, have been worked intermittently, some at one time and others at another. Last year some claims situated on Quadra island, one of the group, had the attention of the Valdes Island Copper Co., with which the late Jas. D. Sword was associated until his death by drowning recently, when proceeding in a launch from the mining property to the mining recorder's office at

Quathiaski cove. The company has been opening several big deposits of copper-bearing magnetite, and is now preparing to construct a wagon road to allow of ore being hauled to tidewater for shipment, thence to one of the copper smelters. Beside the group of claims on Quadra island, the company has a small island in the neighborhood on which similar ore occurs, and this, too, has been developed to some extent by open cuts during the last year. It is expected that smelter returns will be good and that results will well warrant mining the ore on a fairly large scale.

On Queen Charlotte Islands.

The Tassoo Copper Syndicate, of Vancouver, of which Mr. Robert R. Hedley is manager, is preparing to make a shipment of about 500 tons of ore from its mine, on Moresby island of the Queen Charlotte group, to the Tacoma smelter. An aerial tramway 2,300 ft. long will give communication between the mine and a shipping place on Tassoo harbor. There is excellent harborage in an arm of that harbor, an island 200 acres in extent, affording protection against strong winds from the sea. No dock is needed; only a float between the vessel unloading or taking on cargo, to keep it away from the rocky shoreline. The ore averages two per cent. in copper and rather less than \$1 a ton in gold and silver. The nature of the ore is such that a very favorable smelting rate has been obtained for it.

The Metropolitan Trust Co., of New York City, is planning to diamond drill its coal lands on Graham island, of the Queen Charlotte group, under the direction of Dean Milnor Roberts, of Seattle, Washington, who spent part of last season on the property doing surface exploration. Mr. W. L. Barton, of Queens-town, Moresby island, will be head driller. Drilling will be commenced in March and two drills will be used—one with which a depth of 1,500 can be reached and the other a small one. The company controls many thousands of acres in what are known as the Robertson and Wilson fields, respectively.

Portland Canal Mining Division.

Indian Mines, Ltd.—While the most important mining operations in progress in this division during the winter now drawing to a close have been those of the Portland Canal Tunnels, Ltd., work has also been done on other properties. Prominent among these is that of the Indian Mines, Ltd.—a group of claims situated in what is known as the Salmon River region, and on which one of the veins, containing ore of excellent grade is being drifted on. Near the surface there is a deposit of ore 19 ft. in width, and on this a prospect shaft was sunk 25 ft., and the ore taken out was estimated to average about 40 per cent. lead, 20 oz. silver to the ton and a little gold. An adit was driven with the object of opening this shoot of ore at about 165 ft. depth; at 200 ft. in from the portal this drive entered a body of ore which filled the face of the working. It was expected that it would require another 50 ft. of driving to get under the ore shoot opened from the surface.

Montana Group.—Recently four tons of ore was sent to the smelter at Tacoma, Washington, from the Montana group, on Marmot river, for test purposes. Development work done on this property has exposed a considerable quantity of ore, believed to be of good grade. The owners are awaiting receipt of smelter returns before deciding whether to continue work themselves or lease the property.

Portland Canal Tunnels, Ltd.—Late reports from the scene of the operations of the Portland Canal Tunnels, Ltd., which has driven an adit a distance of

about 3,000 ft., with the object of cutting at depth veins of ore opened from the surface on the property of the Portland Canal Mines, Ltd., and neighboring groups, have been encouraging, and the prospects are believed to be favorable for profitable working of the ore shoots found in three veins on which drifting has been done from the low level adit. Where crosscut, the veins did not show ore of commercial value, though they are in places of considerable width. Latterly, ore mineralized with pyrite and galena has been found, and the outlook is now regarded as being distinctly favorable for successful operation of the properties, in connection with working which suitable arrangements were made before the crosscut adit was driven. Beside providing for mining under far more advantageous conditions than attended the operations of the several companies that opened the veins from the surface, the driving of this long adit will facilitate the development of a water-power in which the Tunnels Co. is also interested. The outlook for mining in this part of Portland Canal mining division has been much improved by the results of the enterprising policy of the Tunnels Co., for other companies will now be encouraged to also undertake work at greater depth than heretofore.

Near Hazelton, Skeena District.

Silver Standard Mine.—There is much activity at the Silver Standard Mine, on Glen mountain, distant about five miles from the old town of Hazelton, Skeena district, and six miles from the nearest point on the Grand Trunk Pacific Railway. Ore is being hauled to the railway and taken thence to Prince Rupert, from which port it is conveyed in steamers to Vancouver and then by rail to the Consolidated Mining and Smelting Co.'s reduction works at Trail, West Kootenay. Freight charges are consequently heavy, yet this, notwithstanding, shipment of the ore is being continued, several hundred tons having lately been sent to the smelter. An idea of the metal contents of the ore can be obtained from the following return from 282 tons shipped last summer: Metals paid for by the smelter—gold 63 oz., silver 40,883 oz., lead 149,525 lb., total value \$30,001.61., or an average of \$106.42 a ton. The property is owned by the well-known railway contractors, Stewart & Welch, with whom are associated Mr. McLeod and others. Small shipments are being made from the American Boy group, on Nine-mile mountain, owned by the Harris Mines, Ltd. One carload lot from this property reached Trail several weeks ago.

STEEL PRODUCTION FOR 1913.

The output of the Steel Company of Canada for 1913 was as follows:

	1912. Tons.	1913. Tons.	Increase.
Pig Iron	174,082	180,712	6,630
Open hearth ingots ...	89,456	157,661	68,205
Iron and steel bars ...	156,032	192,509	26,477

The output of the Canada Iron Corporation is as follows:

Pig iron output during 1912	88,163 gross tons	970 lbs.
Pig iron output during 1913	62,524 gross tons	839 lbs.

Decrease. 25,639 gross tons 140 lbs.

CARIBOU COBALT.

A 2½ per cent. dividend has been declared on the capital stock of the Caribou Cobalt Mines Co., payable on March 30th.

MARKETS

STOCK QUOTATIONS.

(Courtesy of J. P. Bickell & Co., Standard Bank Building,
Toronto, Ont.)

March 9, 1914.

New York Curb.

	Bid.	Ask.
Alaska Gold	21.50	22.00
British Copper	1.50	1.62
Braden Copper	7.50	7.62
California Oil	336.00	338.00
Chino Copper	40.00	40.62
Giroux Copper	1.00	1.25
Green Can.	38.00	40.00
Granby	81.00	88.00
Miami Copper	22.50	23.00
Nevada Copper	15.00	15.50
Ohio Oil	174.00	178.00
Ray Cons. Copper	19.50	19.75
Standard Oil of New York	217.00	220.00
Standard Oil of New Jersey	410.00	412.00
Tonopah Mining	6.87	7.00
Tonopah Belmont	7.75	8.00
Tonopah Merger . . . . .	.60	.62
Inspiration Copper	16.50	16.87
Goldfield Cons.	1.68	1.81
Yukon Gold	2.87	3.00

Porcupine Stocks.

Apex . . . . .	.02½	.02¾
Dome Extension . . . . .	.11½	.12
Dome Lake . . . . .	.36	.37
Dome Mines	16.00	16.50
Foley O'Brien . . . . .	.19	.21
Hollinger	16.00	16.25
Jupiter . . . . .	.14	.14¼
McIntyre	1.33	1.35
Moneta . . . . .	.02	.03
Northern Exploration	2.50	3.00
North Dome . . . . .	.15	.17
Plenaurnum . . . . .	.40	.60
Pearl Lake . . . . .	.09	.09½
Porcupine Gold . . . . .	.13	.13½
Imperial . . . . .	.015½	.02
Porcupine Reserve . . . . .	..	.06
Preston East Dome . . . . .	.017½	.02
Rea . . . . .	.15	.20
Standard . . . . .	..	.00½
Swastika . . . . .	.04	.04½
United . . . . .	..	.01
West Dome . . . . .	.15	.20
Porcupine Crown	1.27	1.32
Teck Hughes . . . . .	.20	.30

Cobalt Stocks.

Bailey . . . . .	.05	.05¼
Beaver . . . . .	.30½	.31
Buffalo	1.60	1.72
Canadian . . . . .	..	.10
Chambers Ferland . . . . .	.18½	.19
City of Cobalt . . . . .	.40	.50
Cobalt Lake . . . . .	.67	.70
Coniagas	8.00	8.10
Crown Reserve	1.83	1.85
Foster . . . . .	.08	.09
Gifford . . . . .	.03	.04
Gould . . . . .	.03	.03¼
Great Northern . . . . .	.15	.15¼
Hargraves . . . . .	.02	.03

Hudson Bay	71.00	72.00
Kerr Lake	4.70	4.75
La Rose	1.68	1.72
McKinley	1.22	1.27
Nipissing	6.80	6.84
Peterson Lake . . . . .	.42½	.43
Right of Way . . . . .	.04	.04½
Rochester . . . . .	.02	.03
Leaf . . . . .	.02	.02½
Cochrane . . . . .	.35	.40
Silver Queen . . . . .	.03	.04
Timiskaming . . . . .	.17¾	.18
Trethewey . . . . .	.24	.26
Wettlaufer . . . . .	.06	.07
Seneca Superior	2.90	3.20

TORONTO MARKETS.

March 11.—(Quotations from Canada Metal Co., Toronto):

Spelter, 5¼c. per lb.

Lead, 5¼c. per lb.

Tin, 40c. per lb.

Antimony, 8½c. per lb.

Copper, casting, 15½c. per lb.

Electrolytic, 15¼c. per lb.

Ingot brass, 10 to 15c. per lb.

March 11.—Pig iron.—(Quotations from Drummond, McCall & Co., Toronto):

Summerlee No. 1, \$26.50 (f.o.b. Toronto).

Summerlee No. 2, \$25.50 (f.o.b. Toronto).

March 11.—Coal—(Quotations from Elias Rogers Co., Toronto):

Anthracite, \$8.25 per ton.

Bituminous, lump, \$5.25 per ton.

GENERAL MARKETS.

March 9.—Connellsville coke (f.o.b. ovens).

Furnace coke, prompt, \$2.00 per ton.

Foundry coke, prompt, \$2.40 to \$2.60 per ton.

March 9.—Tin, straits, 37.55c.

Copper, Prime Lake, nominal.

Electrolytic copper, 14.25 to 14.35c.

Copper wire, 15.50c.

Lead, 4.00c.

Spelter, 5.30 to 5.40c.

Sheet zinc (f.o.b. smelter), 7.25c.

Antimony, Cooksons, 7.20 to 7.25c.

Aluminum, 18.50 to 18.75c.

Nickel, 40.00 to 45.00c.

Platinum, hard, 10 per cent. \$46.00 to \$47.50 per oz.

Platinum, hard, 20 per cent. \$49.00 to \$51.50 per oz.

Platinum, soft, \$43.00 to \$44.00 per oz.

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

Quicksilver, \$38.00 per 75-lb. flask.

SILVER PRICES.

February.	New York cents.	London pence.
24	57⅞	26⅞
25	57½	26⅞
26	57½	26⅞
27	57½	26⅞
28	57⅞	26⅞
March.		
2	57¾	26⅞
3	57¾	26⅞
4	58¼	26⅞
5	58½	27
6	58¼	26⅞
7	58	26⅞
9	58⅞	26⅞
10	58⅞	26⅞