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CIRCULATION.

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JUSTICE.

Whatever delays and dallings there may have been in bringing to justice the perpetrators of the Highland Mary-Lucky Boys-Blue Bell group of swindlers, there is satisfaction in recording that the integrity of the law has at last been vindicated. On Saturday, Jan. 16, 1909, Frank Law, one of the chief promoters of these swindles, was adjudged guilty by the jury of the Court of General Sessions. Later, on Jan. 26th, he was sentenced to five years in Kingston Penitentiary by Judge Winchester.

Here, so far as we are concerned, the history of Frank Law closes. We derive no satisfaction from the fact that a fellow citizen has brought disgrace and suffering upon himself and his family. But we are convinced that the whole sordid story will act as a deterrent upon others who may look upon the flotation of bogus mining companies as a legitimate source of wealth.

In considering the history of mining company promotion there are two features that obtrude themselves most unpleasantly. The first is that, almost without exception, the worst of these schemes were those that advertised most extensively in several of the daily newspapers. Looking over the columns of the Toronto World for 1907 we notice thirty large advertisements (including those of Law & Company). Five of the promoters of these concerns are now fugitives from justice. The shares of not one of the thirty companies are worth purchasing to-day. This is indeed a startling indictment.

The second feature that demands remark is the aid given to all of the most unsavory fakirs by members of the legal profession, a profession whose honorable traditions are out of all keeping with this discreditable practice.

It is fair to argue that a promoter's legal adviser has more than usual opportunities of acquiring inside knowledge of the moral standing and business methods of his client. How then can there be justification for a lawyer lending his own or his firm's name to the most egregious schemes for robbing people who happen to have confidence in that name? Has the lawyer no duties as a citizen? Do his legal attainments necessarily place him beyond the pale of the moral code?

Frank Law was not the only malefactor in the case that has just been brought to a conclusion. Equally guilty were Russell, and, probably, Abendroth. But the history of the case reveals the fact that there was an intimate connection between the office of Lennox & Lennox, barristers, and the operations of Frank Law & Company. One member of the former firm was president of Silver Bird. Another was discovered to

be the author of the famous "Michael Macdonald Report" on Highland Mary.

We believe that the great bulk of practising lawyers in Toronto, and, indeed, in Canada generally, would refuse utterly to touch such promotions as those alluded to above. We also believe that no members of the profession should be allowed to bring it into evil repute by making easy the path of the mining fakir.

Similarly it should be impossible for any newspaper to become the incubator of swindles without losing its fair name.

REPORT ON THE MINING AND METALLURGICAL INDUSTRIES OF CANADA.

When it was announced about two years ago that the Mines branch of the Department of Mines, Ottawa, had received instructions to collect and publish full information concerning the mining and metallurgical industries of Canada, few people had any conception of the magnitude of the work. Whilst it was universally acknowledged that some attempt to present in accessible and compact form the mass of data obtainable, the impression was current that this would not necessarily consume more than six or eight months. However, the event has proved that a practically complete description of the mining and metallurgical activities of Canada requires a volume of 972 pages, embodying the labors of a large special staff over a period of at least eighteen months.

The bulky volume before us is not, however, to be taken as the final and definitive result of two years' labors. Whilst in its present form it is undoubtedly valuable, it will prove of but ephemeral interest unless revised editions are brought out periodically. Hence, this report may be regarded as providing not only present information that will prove of business value to all classes of investors, but as forming a working basis for an annual publication that will provide an immensely useful source of reference. And this, we believe, is in accordance with the plans of the Department of Mines.

In view of the large sums of money expended in the preparation of this report the Department has decided to fix its price at one dollar per volume. This nominal price will deter no one interested in the mining industry from securing a copy. It will have the effect also of preventing irresponsible persons from trespassing upon the generosity of the Department.

It is probable that had the various operating companies been grouped by industries instead of by territorial divisions, the report would have been more compact and even easier of reference. This is, however, not a matter that detracts seriously from the publication. No doubt the former plan would have been more costly and, under present circumstances, less complete.

We may also suggest that an arrangement whereby the general information is thrown together in the first part of the volume, and all data as to the personnel of

directorates, etc., placed in smaller type at the back of the report, would render the bringing out of new editions much less laborious.

On another page we print a more complete notice of the report. Here, however, we may place upon record our belief that the appearance of this comprehensive review of Canada's mining and metallurgical industries is an event of prime significance. Following last summer's efforts of the Canadian Mining Institute it should make our country's resources known all over the world.

We congratulate the Minister of Mines and the officers of the Department upon a monumental work achieved.

FEES AND THE MAN.

Except under extraordinary circumstances it is bad business for the mining engineer to work openly for small or nominal fees. We need not reiterate here all the reasons that justify the consulting engineer in charging substantial amounts for his time and services. It will suffice to mention that in his advisory capacity the mining engineer assumes large responsibilities. His periods of employment are not continuous. Often he may suffer long periods of idleness. Hence, it is consistent neither with his actual needs nor with his professional dignity that he should work for insufficient fees.

A Montreal mining man, ostensibly a mining engineer, advertises in a daily paper the fact that he gives free advice on Cobalt mines and stocks. If one thing is more certain than certainty itself it is that advice thus offered is not worth taking. As to what returns for his trouble the alleged mining engineer expects we may venture a shrewd guess. What his confiding clients must receive will prove an exact equivalent of what they give.

THE MINING ENGINEER'S REPORT.

As to what a mining engineer's report should contain there is a wide divergence of opinion. Some there are who contend that the mining engineer's opinion is the essential element. They argue that, since the mining engineer is a trained specialist, therefore his conclusions, drawn from careful examination of any mine or prospect, are the whole soul of the report.

The subject is one that requires handling with gloves; but there can be no harm in glancing at the other side of the question.

To a person totally unacquainted with mines and minerals, the interior of a mine is much the same as an inordinately large cellar. Unless his eye is caught by the actual glint of gold, or by some other such arresting phenomenon, he carries away merely an impression of gloom. Not only is he unable to interpret the very features that appeal to the mining engineer, but he is

actually incapable of observing them. To a greater or less degree this is true of all untrained persons, from the honest miner down to that worst product of the devil, the "mining expert." Long training, keenness of vision, scrupulous honesty, and adequate experience are necessary to qualify a mining engineer to observe the geological, mineralogical, and other facts, and to record them properly. To see in their true light the facts concerning labor, transportation, market, water, fuel, timber, and the multitudinous other factors that affect all mines, is by no means an easy task. To write of what his professional training has enabled him to see, is even harder. For the engineer is called upon not to disguise his thought in the cheap jargon that the "mining expert" employs on his victim as an anaesthetic. He should set down his facts so clearly, so fully and so accurately that they will be intelligible to any educated man of business.

It is highly probable that the engineer who is able to write such a report as that outlined above, is the person best qualified to draw logical conclusions from the facts recorded. And the engineer's opinion is naturally, that part of the report that is considered most valuable by his clients. But the best opinion has in it more or less of human error. Faulty logic may mar an otherwise unexceptionable document. The "mining expert's" deal with a minimum of fact and a maximum of opinion. The mining engineer owes it to himself and to his clients to present not only his opinions, but also the grounds upon which his opinions are based. Then his recommendations will stand upon their own merits, and not upon the unsafe foundations of professional prestige and public ignorance.

SUFFERING CANADA.

When, not long ago, President Roosevelt organized his famous Annanias Club, membership in which was entirely voluntary, the persons whom he singled out as charter members were the nature-fakirs.

Lately an enterprising magazine has been corraling a bunch of "Canada-fakirs," writers who toy with snow and thermometer at the expense of the Canadian climate. Ignorance and the exigencies of modern novel manufacturing do not justify the practice of libelling our country. There is ample color in facts and there is no difficulty nowadays in obtaining facts.

Except for occasional magazine writers who sometimes select a misty mine as a background and who make as many breaks as space will permit, the mining industry has suffered little at the hands of fictionists. The most that can be said of casual writers about the mineral wealth of the Dominion is that the knowledge behind their allusions is inadequate; even if the writers' goodwill is undoubted.

A case in point is furnished by Miss Agnes Laut, whose "Conquest of the Great Northwest" has recently been published. The book describes the explorations

that began with Hudson's voyage of three hundred years ago, and is based mainly upon Hudson Bay Company records, some of which are brought to light for the first time by Miss Laut.

The Company made several attempts to discover minerals. The expedition of Captain Knight, in 1719, perished on Marble Island, in the northwest part of the Bay. Samuel Hearne's trip to the Coppermine River, in 1770, brought fame to him but no dividends to the Company. Other rumours of minerals on the interior were not regarded seriously. Miss Laut refers to them: "There were legends, too, at Moose and Rupert of great silver mines [what is a mine?] toward Temiscamingue—the field of modern cobalt beds." . . . "How true some of these legends were has been proved by the great cobalt mines of Modern Ontario."

No reader of Miss Laut could suppose that silver is being mined in the Temiscamingue. She evidently supposes that only cobalt is found at Cobalt, and, also, that cobalt is something akin to peat or asphalt. "Cobalt beds" is a delightfully feminine description. Imperfectly informed persons, who have heard of Cobalt, might even believe that Miss Laut wishes them to understand that there is no silver in the district. It is to weep that Canadian writers at least do not give the whole truth about matters on which they write with every assurance of authority.

There can be no fair complaint to-day either of lack of authentic information concerning Canada, or of dearth of inspiration in the history of the Canadian nation. The story of the Hudson Bay Company is romantic enough to satisfy the most imaginative. And, coming down to our own times, there is no better reading to be found than many of the records of explorations conducted by Canadians. Take, for instance, Dr. Low's "Cruise of the Neptune," a simple, direct narrative of adventure in our northeastern sub-arctic; or J. W. Tyrrell's "Across the Sub-Arctic of Canada." Both these books should be available to every school child. Mr. Tyrrell's book, descriptive of an arduous journey undertaken by himself, and his brother, Mr. J. B. Tyrrell, is a straightforward, unornate story of adventure in the great barrens of northwestern Canada and the Hudson Bay region. In due time it will be looked upon as a classic, not alone because we know it to be scientifically accurate, but also because it is as entertaining as the best novel. At present the Canadian public is content to assimilate silly libels on its climate and resources, dished out by persons whose knowledge of the country is both inaccurate and scanty.

An important witness in giving evidence before the Royal Commission on safety in mines, declared himself to be opposed to frequent inspection of collieries. The Government inspector, he contended, should always be equal or superior to a manager. The working-man grade of inspector would be an anomaly.

EDITORIAL NOTES.

The Eleventh Annual General Meeting of the Canadian Mining Institute will be held in Montreal, at the Windsor Hotel on the 3rd, 4th, and 5th of March, 1909. The list of papers to be presented is already large and is being added to from day to day. Information as regards railway arrangements, etc., appears on another page in this issue. We commend it to the careful attention of our readers.

Mr. J. B. Tyrrell has been advised of his election as corresponding member of the Council of the Institution of Mining and Metallurgy, London, England. This is a signal honor. The Institution of Mining and Metallurgy is the most carefully organized body of its kind. Membership is only attainable by professional men of high standing, unblemished reputation and a long record of practical service. Election as corresponding

member of the Council is, of course, a still higher honor.

The Cobalt representative of Beer, Sondheimer & Co., 42 Broadway, New York, has drawn our attention to an inaccuracy that occurred in our issue of January 15th. In that issue the shipments of ore to Germany were reported as being about 140 tons of low-grade ore. These figures were hastily prepared and, in this case, were inadequate. Beer, Sondheimer & Co., during 1908, contracted for and shipped 200 tons of high-grade ore from the Temiscaming & Hudson Bay Co.; 150 tons high-grade ore from Kerr Lake; 60 tons high-grade ore from Crown Reserve; and 60 tons high-grade from Silver Cliff. In addition to these shipments two cars of low-grade ore were shipped from Silver Cliff.

The high-grade ore is sent to Hamburg, Germany. The low-grade goes to Norfolk, Virginia.

SOME RECOLLECTIONS OF EARLY COPPER MINING IN CANADA.

Written for the Canadian Mining Journal by Dr. James Douglas.

The early records of copper mining in Canada tell a story of mingled success and failure, the failures unfortunately decidedly preponderating. Within the provinces of Quebec and Ontario, until the building of the Canadian Pacific and the discovery of the Sudbury Copper-Nickel ores, active mining in Ontario was confined to a group of mines on the shore of Lake Ontario, and a feeble attempt to work the native copper beds of Michipocoten Island. In Quebec the area of copper mining was confined to the eastern townships, where unquestionably large deposits of low grade copper ores of very different character exist.

The Bruce mines were discovered on the land of the Montreal Mining Co. on Lake Huron in 1846. An opening was said to have been first made upon them in 1847. The Wellington mines were shortly afterwards discovered, and opened on the lands of the same organization not far from the Bruce Mine. When active operations were undertaken John Taylor & Sons, of London, at the time the most noted of mine managers, took general charge, and therefore all the work and machinery above and below ground, were designed and conducted on the Cornish type. The veins on the Bruce and Wellington properties varied from a few inches to thirty feet in width, the mineral consisting of chalcopyrite associated with small quantities of iron pyrites in a quartz gangue. The ore was therefore admirably suited to yield a high concentrate to mechanical concentration. Returns of shipments from 1847 to 1860 show about 10,000 tons of concentrates averaging about 20 per cent. from the Bruce mines, and from 1847 to 1862 some 6,000 tons from the Wellington mines. The average of the ore mined is supposed to have been about 4 per cent. The highly acid character of the ore unfitted it for smelting, but attempts to smelt the concentrates with coal imported from Ohio were financially uneconomical. At that period the success attained by Henderson in leaching the Tharsis ore from

Spain by the Longmaid method induced the Company to attempt applying it to the Bruce ores. A M.-de-Bussy was sent from Europe to erect and superintend the operation of the plant. It was found, however, that while roasting with salt such highly sulphuretted ores as those from the Spanish peninsula chlorodized very thoroughly the copper, the method was not as applicable to pure chalcopyrite in a silicious gangue. At any rate the method was speedily abandoned, and after that the mines remained idle for a long period of time. De Bussy's experiments were made about the year 1869-70.

About the same year as the Bruce mines were discovered, namely, 1846, copper was discovered in the township of Inverness, County of Megantic, in Lower Canada. Some very rich ores of erubescite were discovered at surface; considerable work was done and some shipments were made in 1849-1850 and 1851. The surface indications did not however lead in depth to either large or permanent deposits, and the Inverness mines were after 1851 abandoned. But prior to that time some ores of erubescite and bornite had been discovered on the farm of a Mr. Harvey in the 15th range of the township of Leeds. The Quebec and St. Francis Mining Company was organized in 1847 to develop this property. John Arthur Phillips, then the most noted authority in England, was sent out in 1852 to report on the property by John Taylor & Sons. He was impressed but not persuaded. Subsequently, however, English capital was enlisted, and the English and Canadian Mining Company was organized. It erected concentrating works of the Cornish type, and carried on operations for some twenty years, though during half that period the Canadian stockholders owned the whole stock of the Company. The result of their operations went to show that the rich veins which appeared at surface, though they cut across the shales of the Quebec Group, were not continuous for any long

distance, and terminated, at a comparatively shallow depth, in a bed of slate lying conformably with the strata and carrying, in seams and in disseminated particles, from $1\frac{1}{2}$ to $3\frac{1}{2}$ per cent. of copper. Beneath this bed, and apparently terminating in it by a fan shaped extension of its quartzite gangue, a vein—called the Fanny Eliza—was discovered with almost verticle dip, and carrying a chute of rich ore which was ultimately extracted to a depth of several hundred feet. The bed in the vicinity of these surface and deep veins averaged over 3 per cent. of copper, but the yield fell off to about $1\frac{1}{2}$ per cent. as extraction extended beyond the points where these veins apparently entered and left the bed. The richest portions lay between, or at no great distance from the space intervening between these veins. From that area some five or six thousand tons of ore was extracted which averaged some 3 per cent. Beyond that area, where the ore apparently averaged about $1\frac{1}{2}$ per cent., the lower grade compelled abandonment of work on the bed proper.

But work was prosecuted on the "Fannie Eliza" vein, below the bed for years, if not at a profit, yet not at a loss. The production, of course, measured by the output of our modern establishments, was insignificant, amounting to 500 tons of 20 per cent. concentrates a year,—equivalent, therefore, to only about 200,000 lbs. of metallic copper. This however, was sufficient to give the property a certain ranking, when all the mines of Lake Superior turned out only 12,000,000 pounds of copper, and the total production of the United States was only about 17,000,000 pounds.

Two other beds were cut in running a tunnel, but their value was never accurately determined. On an adjacent property the so-called "Daigle Lot" a vein of bitter spar was opened, carrying occasional grains of gold associated with bornite, but the quantity was only sufficient to raise hopes without gratifying them. The English and Canadian Mining Company was succeeded by a Scotch Company, but instead of developing its known deposits sunk its capital in looking for new ones. During the active career of the mine the concentrates had to be hauled twenty miles to the nearest station on the Grand Trunk Railway, and shipped either to England or to Baltimore. Water for concentration was collected in dams, though the south branch of the Palmer River, a stream of considerable size, was only two miles distant. It was at one time contemplated to build a tramroad from the mine to the river and there erect a concentrating plant. The more economical plan would have been to pump the water to the ore instead of hauling the ore to the water. Under these disadvantages it is almost to the credit of the mine that for a number of years it was self-supporting. This raises the question as to whether these copper-bearing beds in Leeds, Inverness, Halifax and many other localities in the eastern townships might not, with better machinery for treatment, under modern metallurgical methods, and with cheap transportation, be at some of the more favorably selected locations, worked to a profit. To all appearances there are large quantities of ore, but whether anywhere it is of a working grade can only be determined by the expenditure of more money, and so much has already been fruitlessly spent that capital has become timid. The same, however, has been true of other deposits on the continent, which were abandoned in the past for the same reason, and are today most profitably worked.

During this same early period a large body of ore was discovered at Actonvale on the Grand Trunk Rail-

road between Richmond and St. Hyacinth. The ore—a more or less decomposed sulphide of copper—was disseminated through limestone, and in one place concentrated into a large mass which was worked very profitably by open cut from surface, and so far as published records give the figures, the Acton Mine yielded from 1859 to end of 1861—6,000 tons of 17 per cent. ore and concentrates, and during the following year about 2,500 tons of 12 per cent concentrates, which were shipped to the United States.

Meanwhile the large masses of iron and copper sulphurets near Lennoxville were discovered. The first company to work them actively was a Hartford organization, which roasted the ore in heaps and ran it down into matte. Recognizing the waste inherent in such an operation, the company erected sulphuric acid works on the south shore opposite Quebec, with a view of making superphosphates out of the apatites from the Ottawa. The intention and the enterprise thus shown were admirable, but may be assumed to have been financially disappointing, for that company and its works in time disappeared. A Montreal company applied the Hunt & Douglas wet process unprofitably. Another attempt was made by a Scotch company to leach the ores by the Longmaide-Henderson method, which we have already referred to as having been applied unsuccessfully to the Bruce ores of Lake Huron. The Ascot ores were from a mineralogical point of view admirably suited. Nevertheless the experiment was financially unsuccessful. But for years the ores of that district have at least been profitably mined and worked under the admirable management of the Nichols Copper Company, who mine the ore, utilize so much of it as can be advantageously disposed of, in making sulphuric acid on the spot, and ship the balance for chemical and metallurgical treatment to their large works at Laurel Hill, Long Island. Another United States company—Orford Company—worked one of their deposits in the seventies and erected their Orford Works, in New Jersey, to treat them. The mines are still worked by some of the same owners—but the connection of the mines with the large owners, to which they gave their name—was long ago dissolved.

CANADIAN MINING INSTITUTE ELEVENTH ANNUAL MEETING.

The Eleventh Annual General Meeting of the Institute will be held in the city of Montreal, on Wednesday, Thursday and Friday, March 3rd, 4th and 5th, 1909.

The Institute headquarters will be the Windsor Hotel, Montreal, and members are requested to notify the Secretary as early as possible of their intentions to attend, in order that accommodation may be reserved for them.

Application has been made to the Railway Passenger Association for special transportation privileges for members and their friends attending the meeting, and the conditions under which these will be granted are as follows:—

1. A single first-class ticket must be purchased not more than three days (Sunday not to be counted a day) prior to the opening day of the meeting.
2. A standard certificate of such purchase must be obtained from the ticket agent issuing the transportation.

3. A standard certificate must be endorsed by the Secretary of the Institute and stamped by a representative of the railways, who will be in attendance at the Secretary's office, room 3, Windsor Hotel, on the three days of the meeting at hours to be bulletined later.

4. A charge of twenty-five cents (25c.) will be assessed on each certificate.

The provisional programme of the meeting is as follows: The proceedings will be opened at 10 a.m., on Wednesday by an address from the President. The Wednesday morning, and, if necessary, the afternoon session of that day will be devoted to the consideration of business affairs to be submitted to the meeting, including the report of the Council; the Treasurer's statement and balance sheet; the proposed repeal of and amendments to the by-laws; and the election of council

for the ensuing term. A selection of papers will be read and discussed on Wednesday evening, and at the Thursday and Friday sessions.

Among those who have either definitely or provisionally promised to present papers are the following: Dr. J. F. Kemp, of Columbia University; Dr. Heinrich Ries, of Cornell University; Mr. H. P. H. Brumell; Mr. W. Blakemore; Mr. H. S. Badger; Mr. R. E. Chambers; Mr. F. Cirkel; Mr. Eugene Coste; Mr. E. T. Corkill; Mr. W. D. Craig; Mr. D. B. Dowling; Dr. B. E. Fernow; Mr. S. S. Fowler; Mr. J. C. Haas; Mr. Frederick Hobart; Mr. H. E. T. Haultain; Mr. E. B. Kirby; Dr. A. C. Lane; Mr. G. C. Mackenzie; Mr. F. C. Merry; Mr. A. J. McNab; Mr. J. C. Murray; Mr. J. Obalski; Mr. D. W. Robb and Mr. George R. Smith.

The annual dinner will be held on Friday evening at 8 o'clock.

THE MINERALS OF NOVA SCOTIA DURING 1908.

A. S. Barnstead.

The cause of Nova Scotia's general prosperity in later years lies to a very great extent in the fact that the Province possesses extraordinary wealth in her mines, resources that are appreciated alike by Government and people. While the Government owns the minerals, yet the actual mining is left to the enterprise of private capitalists who hold their rights in leases from the government. This is a source of considerable revenue to the Province and the large increase in royalties in the last dozen years has enabled the Government to enter upon a policy of expansion along other lines.

The rental exacted by the Crown is very small. A coal lease carries with it a royalty of ten cents on the long ton, though the Province made a special arrangement with the Dominion Coal Company in 1893 for a 99-year lease whereby that company pays 12½ cents per ton royalty. Two per cent. on the gross value brings a revenue of 36 cents per ounce for unsmelted gold and 38 cents for smelted gold. Five cents per ton is what the Government exacts as royalty on iron taken from the ore beds reserved by the Government. Licenses to search are issued at the rate of \$30 for an area of five square miles in the case of minerals other than gold or silver. Leases for four renewable terms of twenty years each can be selected from them at a cost of \$50.00 each, and are subject to an annual rental of \$20.00. Licenses to search for gold cost 50 cents per area and leases \$2.00 per area, of 250 feet by 150 feet, for a term of forty years.

Though general depression has affected the coal trade elsewhere, it is only since November that its effects have been noticed in a lessened activity at the coal mines. Nova Scotia has felt the stringency less severely than might have been expected. The year for some industries has been one of arrested development, and for that reason a greater expansion, especially in the coal trade, has been prevented. A summary for the 12 months past places the mineral output of the Province at \$17,412,000. This is about \$2,000,000, in excess of the value for 1907, so that a fair degree of satisfaction is generally felt. The outlook is, however, affected by two important problems, the solution of which is looked forward to with interest. There is, first, the Privy Council decision in the Dominion Coal and Steel case, which may be announced before these words appear; and, secondly, the invasion of the St. Lawrence market by the coal companies of the

United States. This dumping process has already made inroads into Nova Scotia's natural market, and how long this American aggression will continue or what remedy will be applied to conserve the St. Lawrence coal trade to Nova Scotia is still in the future.

When a few months ago, the amount of increase in the imports of American bituminous and anthracite coal into the St. Lawrence market became known, surprise was everywhere expressed and some alarm felt lest these inroads might have a serious effect on our coal industry. There is a factor in the situation that appeals with some force to the writer. It is this: American coal men are enabled to make low contracts because owing to introduction of labor saving machinery and other causes the labor cost of a ton of coal has not increased to them. To counterbalance this Nova Scotia mines are on the seaboard—the Springhill mines being the only ones not on tidal waters, and they are but 30 miles from the shipping pier. Of course, this is no handicap in view of the long hauls that American coal companies have to contend with. Our miners are well paid, none better. If the cost of living were reduced, our miners could accept lower wages and be as well, if not better, off. What remedy is to be applied? Simply this, back to the farm! The demand for labor in the mines has been so great in the past that farmers and their sons have left the plow and the hoe to shoulder the pick and shovel. As a consequence not five per cent. of the necessaries of life consumed by the mining population is produced in the neighborhood of the mines. Ontario, Quebec and Prince Edward Island are supplying produce to the colliery towns, which might easily be raised in Cape Breton, Pictou and Cumberland Counties. This process of draining the farm of its workers to supply mine labor has, within the past decade or two, practically depopulated some of the rural sections and helped to create the abandoned farm problem in Nova Scotia. Added to this, were the great opportunities thought to lie in the far fields of the Western plains. The lure of the West has been a seductive one and its captives are numbered by thousands.

What better remedy is there than to point out the harvest for the farmer and market gardener in the neighborhood of the mines, and, if our own sons do not return to the farms, to induce a satisfactory immigration that will take advantage of the opportunities. Thus will the

cost of living be reduced, and, mayhap, as a direct result, the cost of coal production. It is a matter in which all must work together. There is, indeed, greater necessity for common action in view of the American competition that has lately developed in the St. Lawrence market.

But the editor has asked for some statistics of the mining industry for 1908. The prefatory note cannot be extended. The figures given are those for the Government financial year ended September 30th last. In coal th figures for the calendar year show a slight reduction from that of the fiscal year.

In 1908 the quantity of coal raised was 6,299,292 tons, of which 5,485,583 tons were sold, 118,499 used by workmen and 496,485 by engines. It is of interest to compare the production and sales and the amount used by collieries for the last ten years.

Coal.

Production and Sales by Collieries.

	Production.	Sales.	Workmen.	Engines.
1899	2,642,333	2,419,137	51,903	124,280
1900	3,238,245	2,997,546	52,974	156,108
1901	3,625,365	3,119,335	63,865	214,342
1902	4,366,839	3,898,626	61,635	279,014
1903	5,255,247	4,621,074	75,503	393,046
1904	5,247,135	4,544,609	80,811	368,398
1905	5,050,420	4,475,284	71,303	355,534
1906	5,866,605	5,194,590	84,721	362,746
1907	5,730,660	5,046,690	103,873	414,413
1908	6,299,282	5,485,583	118,499	496,485

The figures of the increased colliery consumption in the last ten years tell better than words can express the fact that the mines are larger, requiring more ventilation, haulage and pumping and that labor-saving machinery is more extensively employed. In 1899 five per cent. of the production was used as fuel for the colliery engines; in 1908 eight per cent. went for this purpose.

The total production of coal in Nova Scotia by counties and companies is as follows:—

Cape Breton—				
Dominion Coal Co.	3,816,958			
N. S. Steel and Coal Co.	662,350			
North Atlantic Colliery Co. ..	58,777			
McKay Mining Co.	13,560			
Sydney Coal Co.	4,801			
				4,556,446
Inverness—				
Inverness Ry. and Coal Co.	283,705			
Port Hood Ry. and Coal Co.	99,700			
Mabou Co.	19,250			
				402,635
Pictou—				
Acadia Coal Co.	413,782			
Intercolonial Coal Co.	315,590			
N. S. Steel and Coal Co.	47,845			
				777,217
Cumberland—				
Cumberland Ry. and Coal Co.	416,132			
Maritime Coal, Ry. & Power Co.	66,969			
Minudie Coal Co.	48,397			
Strathcona Coal Co.	23,928			
Great Northern	2,726			
Atlantic Grindstone & Coal Co.	861			
				559,013
Colchester Coal Co.				3,951
				6,299,282

From the above statement it will be at once observed that the Dominion Coal Company has more than half of the output of the Province to its credit. This is greater than the previous year's product by 360,021 tons. The holdings of this company will allow a continuance of the present output for a thousand years and this is under rather than over-estimated, as it is quite impossible to make an accurate determination of the value of the submarine areas.

Eighteen thousand men found employment at the mines of Nova Scotia in 1908 and 3,000 additional men, indirectly depending on the coal industry, were engaged in railway transportation and at the shipping piers.

The great expansion of the coal industry of Nova Scotia may be judged from the fact that in the last eight years the total amount of coal sold was 36,197,653 tons. In the last ten years previous to that the total sales amounted to 20,552,526. At the same rate of increase the end of the present ten year period will see nearly two and a half times the quantity sold as in the previous decade.

The Nova Scotia Steel and Coal Company did not increase its output, though much development was done and two practically new collieries were opened that brought up the capacity of the collieries at Sydney Mines to over four thousand tons per day. Moreover, "Sydney No. 4" is now the only electrically worked colliery in the Dominion. This company is in a decidedly unique position in that it possesses collieries of its own adjoining its blast furnaces and open hearth plant for iron and steel production; at Point Edward it has its limestone quarries and at Wabana, off the Newfoundland coast, its iron mines. In the latter part of 1908 the company drove a pair of slopes or tunnels to its submarine iron ore beds and discovered a magnificent bed of ore equal in purity and greater in height than that worked on land.

The North Atlantic Collieries Company at Port Morien have entered the market this past year to some effect, having increased their output from 981 to 58,777 tons. This company possess valuable submarine areas and are working a continuation of the Blockhouse seam, noted in the past as a producer of the best gas coal.

The other companies operating in Cape Breton and Inverness Counties have all shown substantial gains in their output. The Cape Breton Coal Mining Company's colliery at New Campbellton in Victoria County has changed hands and an English lumber syndicate will hereafter operate it as a source of supply for their operations in Newfoundland. The Mabou Mines have been kept in good working condition, but no development can be recorded. In Richmond County two government drills have been at work. It is the policy of the Provincial Government to furnish a diamond or a calyx drill and keep it in repair. The prospecting company pay the expenses of its operation except where boring takes place at an extraordinary depth, when the Government may lend assistance.

The coal companies of Pictou County maintained a steady output during the year and until November there was no lack of employment.

The Cumberland Coal Company were enabled, owing to the cessation of the strike at Springhill, to increase their production by 75,093 over that of 1907. At Chignecto the Maritime Coal, Railway and Power Company have made extensive advances during the past year. A new slope has been completed to a depth of 2,400 feet and levels broken off east and west at 1,800 and 2,300 feet from which they are now getting an output. There is an up-to-date bankhead, the mine is equipped with modern machinery and the company are capable of

handling an output of 1,500 tons per day. Nearly all the other operating companies have maintained or slightly increased their previous output.

Gold.

The gold production of Nova Scotia was less in 1908 than since 1881. The total yield was 12,000 oz. received from 59,664 tons of quartz. This yield was valued at \$237,000, an average return of \$3.96 for each ton of ore crushed. Up to September 30th, 1908, 1,974,836 tons of quartz have been crushed and the yield has been 899,887 oz. Notwithstanding it was a very dull year in production, 525 men—a larger number than in 1907—found employment in 18 different districts. The year 1909 will see greater developments, and it may be that a forward policy in respect to Government assistance to the deep gold-mining industry will be among the features of the new year to record. One-half of the total area of Nova Scotia is in gold-bearing rock. While for the past 45 years gold mining has been prosecuted with considerable success, in proportion to the outlay of labor and capital, the exploiting of this immense source of wealth has been very greatly hindered by a lack of scientific investigation and modern methods of mining. Only a limited capital was required so long as lessees were content to reap the rewards of their industry from the surface croppings. Deeper mining has yet to go beyond the early stages, though serious attempts have been made at North Brookfield by the Brookfield Mining Co. at Caribou and at Goldboro. The former mine was reopened this year past. The Baltimore-Nova Scotia Mining Company at Caribou, Halifax County, has reached a depth of 1,000 feet vertical. The largest company at work is the Boston-Richardson at Goldboro, in Guysboro County. There was crushed at the mill beneath its 950 stamps 38,600 tons of quartz. Much development work was continued and an incline shaft was run from the 400 ft. station to 700 feet and two new levels are being worked from 550 and 700 feet. This company is making good progress, warranting the large outlay of capital.

Development was also carried on at Renfrew by the Eagle Mining Company, which opened old mines, cleaned out shafts and re-timbered their property underground. The largest development, however, is to be noted at Middle River, in Victoria County, Cape Breton. There \$100,000 has been expended by the Great Bras d'Or Mining Company and they are perfectly satisfied with the result thus far secured; 28,000 tons of quartz have yielded 590 oz. of gold. They are working on an outcrop in the glen of the ravine made by the Second Gold Brook, a tributary of the Middle River. The ore contains arsenic, copper and silver, as well as gold, and there are traces of nickel. The stamping mill, crusher and every other necessary modern appliance have been erected. The mining consists in driving tunnels on the vein at the base of the hill and back stopping.

At Leipsigate, in Lunenburg County, the Miemac Company have crushed 2,692 tons and have secured a yield of 868 oz. of gold and 194 oz. of silver.

The Oldham Sterling Gold Mining Company at Oldham have reached a depth of 900 feet and have averaged during 1908 4.53 oz. per ton of quartz; 2,384 oz. have been taken out of 526 tons of quartz during the year.

At Malega Barrens, in Queen's County, the Ponhook Mining Company has cleaned out an old shaft and surface work has been carried on in preparation for greater development.

Very little has been done by the Dominion Antimony Mine at West Gore, owing to legal difficulties that have arisen.

At no other mines is there anything special to record save that the old Touquoy Mine at Moose River, Caribou, Halifax County, may, if recent rumors be correct, begin to be heard as a gold producer.

Iron and Gypsum.

The chief reason why the rich deposits of iron ore are not mined to a greater extent than they are is that the Dominion Iron and Steel Company and the Nova Scotia Steel and Coal Company have both large beds of ore suitable for steel-making at Wabana, off the south coast of Newfoundland. Owing to the cheapness of water carriage and the accessibility of their large deposits, it does not pay to mine ore properties closer at hand. These two companies imported over 1,432,000 tons of ore in 1908. The Londonderry works have not been in steady operation owing to bad trade conditions. Development work has been carried on at Torbrook, Annapolis County, and at Arisaig in Antigonish County.

Nova Scotia deposits of gypsum are among the largest in the world and their value is becoming more widely known. Last year 230,000 tons were exported, a falling off by 100,000 tons from the export of 1907.

Other Minerals.

Copper ores are widely spread and during late years serious attempts have been made to develop some of the more promising of them, and with very satisfactory results. The companies working at Polson's Lake in Antigonish and at Waugh's River in Colchester extended their mining operations.

The steel companies of the Province find abundant limestone in the Province to serve as a flux, and there is sufficient left to supply the world's market. Freestone and granite and other building stones were quarried in large quantities.

Twenty-three million bricks were made out of Nova Scotia clay during 1908 and many valuable clay deposits are to be found in other sections of the Province. This is specially true of a large deposit at Middle Musquodoboit, which will be developed, undoubtedly, on the construction of the Halifax and Eastern Railway Company.

The Sydney Cement Company manufactured 45,000 barrels of cement in 1908, using slag supplied by the Steel Company.

Two very valuable discoveries have been made in Nova Scotia in the last year, both of them in Halifax County. A deposit of galena carrying silver has been found on the Meagher's Grant road about two miles from the head of Musquodoboit Harbor. The interest in this discovery may be judged from the fact that over 800 areas have been taken out at the Government Mines Office.

At Moose River, near Middle Musquodoboit, tungsten has been found in the form of scheelite. The leads have been worked and are most promising. The value of this discovery is made all the greater by the present unlimited demand for this metal. The hardening of steel, the manufacture of chemical compounds and the preparation of the filament of an improved incandescent lamp are among the chief industrial purposes that call for its exploitation and have stirred up in different sections of the world an interest in its search.

Boring has been continued for coal oil near Lake Ainslie, and prospecting for tin in Lunenburg County, while the manganeses properties in New Ross in Lunenburg, in Tennecape, Hants and in Cape Breton have all been developed. Indications point to greater activity during 1909 in the mining world, and greatly increased output is looked for before the year expires.

A VISIT TO THE MINERAL DISTRICTS OF CANADA.

Paper Read Before the Institution of Mining and Metallurgy.

By William Frecheville, Past President, and Hugh F. Marriott, Member of Council.

The Canadian Mining Institute recently organized an excursion to the mineral districts of Canada, from the Atlantic to the Pacific. An invitation was extended to the members of the Institution of Mining and Metallurgy to join the excursion, and the Council was requested to appoint two special delegates as the guests of the Canadian Institute. The Council did us the honor to appoint us as their special representatives, and we therefore had the privilege of taking part in the excursion in accordance with the hospitable invitation of our hosts. Thinking that some account of what we saw may be of interest to the members of the Institution, we submit these notes as conveying a very brief and general idea of the trip.

The party assembled in Quebec at the Chateau Frontenac, on August 24th, 1908, where we were received and warmly welcomed by Sir Lomer Gouin, Premier of the Province of Quebec, Sir George Garneau, Mayor of the city, and the Hon. C. R. Devlin, Minister of Mines for the province.

The party consisted of about forty members, and those from England included the Secretary and several members of our Institution, Mr. Walter Johnson, of the Iron and Steel Institute, Mr. John Gerrard, H.M. Inspector of Mines, Manchester, and a number of coal and iron men from the northern counties and Scotland.

Those from Germany included Professor Potonie, of the Berlin University, and Mining Councillor A. Goebel, of Arnsburg, Westphalia; whilst from the United States we had Professor H. Ries, of Cornell University, Ithaca, New York.

The representatives of the Canadian Mining Institute included Dr. Willet G. Miller, President; Mr. H. Mortimer Lamb, Secretary, and Mr. Stevenson Brown, Treasurer; Mr. Eugene Coste, Past President; Mr. R. W. Brock, Acting Director of the Geological Survey of Canada; Mr. James White, Geographer, Department of the Interior, Ottawa, and Mr. J. Obalski, Superintendent of Mines, Province of Quebec; whilst other members of the Canadian Mining Institute, who did not make the whole excursion, joined us at various points. The Hon. C. R. Devlin, Minister of Mines of the Province of Quebec, accompanied us to the asbestos mines, and the Hon. Mr. Cochrane, Minister of Mines of Ontario, went with us to Cobalt and Sudbury.

In the afternoon we were taken for a run on the St. Lawrence in a special steamer, and, among other things of interest, had an opportunity of inspecting the ruins of the railway bridge which collapsed during construction on August 30th, 1907.

In the evening we left by special train for Sydney, Nova Scotia, to see something of the coal mining and iron and steel industries, which are assuming very important proportions in that part of the Dominion.

Our investigations were facilitated by the Secretary of the Institute, who supplied us with copious and lucidly written literature on the country and works we were about to visit; we were also accompanied by prominent men of the district, who gave us all information possible on points of interest. This procedure continued throughout, and added greatly to the interest of the trip.

The literature amassed in the different provinces on the geology, mineralogy and technical details of the districts, was so great that it was not possible to do more than glance at the main points we had to see. At the same time, those who joined the train and accompanied us from place to place occupied our travelling time almost wholly in supplying and, indeed, insisting on giving us all the information at their command. In this way there are very few idle hours to look back upon.

We arrived at Sydney, Nova Scotia, and spent one day in going over works on the property of the Dominion Coal Co. We went by train to Glace Bay, 19 miles from Sydney, and were taken in charge by Mr. G. H. Duggan, General Manager, and by Mr. Charles Fergie, Mine Superintendent. Mr. Fergie was, at the time of our visit, about to relinquish his appointment, and we had the advantage of his company throughout the remainder of the excursion.

The company has an enormous area, some 144 square miles in extent, inclusive of their rights to the three-mile limit. The outcrop of the coal measures fringes the serrated edge of the easternmost section of the Canadian coast line, the general trend of the dip being seaward.

The coal seams total some 37 feet in thickness, divided among six workable seams, the larger varying between 6 feet and 10 feet in thickness. The seams form basins and channels locally, and may be said as a whole to dip to the east at an angle of 10 to 15 degrees; there are no breaks of any consequence in the formation.

The coal is bituminous and very smoky, but has only a low percentage of ash, sometimes as low as 1.75 per cent. The following analysis is from the Emery seam:—

Volatile matter	31.10
Ash	3.65
Fixed carbon	63.10
Sulphur	1.51
Moisture	0.64
	100.00

The company works 12 mines, and the output is given as 4,000,000 tons per annum. In the Glace Bay basin the principal bed is known as the Phelan seam. The coal is brought to the surface by means of inclined planes from the outcrop, and by rectangular shafts sunk to strike the seams at depth.

Underground haulage is by means of compressed air locomotive engines of the following capacity: A trip of 1 to 1½ miles is made on each charge; the air is carried in the storage cylinders at a pressure of 950 pounds to the square inch; 40 tons of coal are hauled on each train, giving, say, 60 tons gross per trainload hauled. The upkeep of these engines is said to be inexpensive.

In one of the shafts a very ingenious bottom discharge skip was installed, which was automatically filled and discharged with great speed and regularity. The only attention required was the presence of a man

at the pit bottom to see that the charging hoppers were filled in the right order.

On our return from the coal property and on the way to Sydney we looked at some cement works which were in active operation.

The next day we were conducted through the works of the Dominion Iron and Steel Co., which are situated near the town of Sydney. The company own extensive piers, which receive ore and limestone direct from ocean-going steamers, and from here also is loaded the main portion of the output of steel rails for transport by water inland; 150,000 tons of crude ore and flux are received at the works every month during the shipping season. The iron ore is obtained from the company's own mines in Newfoundland, and is of medium quality.

The output from the works consists chiefly of steel rails and rods. The rails are all taken up for use on the Canadian roads, the industry being protected by a bonus on production. The coal required is derived from the Phelan seam of the adjacent Dominion Coal Co. The mixture supplied to the blast furnaces consists of 2 tons ore, 1½ tons coke, 1 ton limestone. The resultant metal is taken to the Bessemer converters, where silicon is blown off. It is then treated in the open hearth under producer gas for 9 to 12 hours, and the sulphur and phosphorus are burnt off. The metal is then poured and cast into ingots, after which it is ready for the rolls.

The works appeared to be very well managed, and, from their activity the company should be in a flourishing condition. Certainly nothing was lacking in the equipment which would aid to that end.

On the evening of the 27th of August the Mining Society of Nova Scotia entertained the Canadian Mining Institute and its guests at dinner at Sydney; the President, Mr. C. J. Coll, took the chair, and the Government of the Province was ably represented by Lieutenant-Governor Dr. C. Fraser, Premier G. H. Murray, and Mr. A. C. Ross, M.P.

The following day we visited the coal mines and the blast furnace plant of the Nova Scotia Steel and Coal Co. This company has six collieries in active operation, of which the output last year was estimated at 3,300 tons a day. The four blast furnaces have each a capacity of 200 tons a day, and there are three open-hearth 40-ton steel furnaces.

The output was stated as 15,000 tons of metal a month, of which 200 tons were converted into steel per day. The whole aspect of this company appeared to be that of a successful institution which had gradually increased its operations on its own merits and resources from a small undertaking to its present magnitude.

We returned to Sydney on board a fine ocean going yacht owned by Mr. James Ross, President of the Dominion Coal Co., and were entertained afterwards at a garden party by Mrs. J. K. Ross at her charming waterside residence. We left that night the easternmost point of Canada on the commencement of our long western journey.

Whilst travelling through Nova Scotia and New Brunswick we had our first opportunity of seeing the scenery so characteristic of Eastern Canada; the pine-clad hills sloping down to innumerable lakes, large and small, the abundant evidence of former glacial action in the moraine matter exposed in the railway cuttings, and the smoothly polished rock surfaces were to be observed wherever the soil has been removed.

From Sydney we made our way back to Quebec, where we stayed a day, and left the next morning for the asbestos mines of Thetford, in the special train of the Canadian Pacific Railway Co. which was to take us out to the Pacific and back. This train consisted of three sleeping cars, a dining car and a baggage car, and it is due to the Canadian Pacific Railway Co. to mention that everything connected with our transport was admirably arranged from beginning to end; in fact, we think we may say that all of us have come back much impressed by the excellent organization and management which are apparent in all this company's enterprises; we have travelled in their trains and steamers and stayed in their hotels, and can speak well of them all.

The asbestos mines of Thetford, Province of Quebec, give the impression of being highly prosperous undertakings. The best known on this side is Bell's Asbestos Co., which was formed in 1889, and is said to have been successful from the start, the dividends having ranged as high as 22½ per cent. in one year on a capital of £200,000. The mill is stated to have a capacity of 250 tons a day.

Adjoining Bell's Asbestos are two other important mines belonging to the Johnson Asbestos Co. and the King Brothers Asbestos Co., both working a continuation of the same deposit as Bell's; their crushing plants are stated to have a capacity of 300 tons and 625 tons per day respectively.

The three principal mines, Bell's, Johnson's, and King Brothers', are grouped about the knob of a little hill, and this small locality is said to produce about 80 per cent. of the total production of Canada, and about 70 per cent. of that of the whole world. The deposit occurs in a mass of serpentine, much squeezed and slicken-sided and intersected by a network of fissures and cracks in which the asbestos has been deposited.

The view held as to its origin is that the serpentine has been dissolved by percolating waters, and deposited in the cracks and fissures in a fibrous form, the chemical composition of the serpentine and the asbestos being identical.

It may be pointed out that several varieties of minerals are included under the term asbestos, the Canadian one being chrysotile, which is pre-eminent not only for its length of fibre, but especially for its exceedingly fine, silky and flexible nature, which renders it particularly applicable for spinning and other processes of manufacture.

The seams in the ground we saw appeared to be, on an average, about ½ inch wide, with fibre stretching from wall to wall. Numerous seams are smaller than this, and again quite a number wider, up to 1½ or 2 inches, or even more, but the impression given was that the average would be somewhere about ½ inch.

To give an idea of the size of the opencast workings, it may be mentioned that at King Brothers' mine it is 700 feet long by about 200 feet wide, with a depth of 165 feet. The rock is blasted out in benches and hoisted to the surface by means of a series of cable derricks working on wire ropes stretched across the working.

At and near the surface the asbestos is, as a rule, considerably changed in character, being yellowish in color and the fibre brittle, and a depth of some feet has to be attained before the fibre assumes its regular color and flexible, silky texture. The impression given was that it would be necessary to go down 10 or 15 feet to get a fair idea of the quality, and, moreover, that the industry entails the handling of such large quantities

of material that tests on a large scale from an extended area would be necessary in the case of a new mine to determine whether it was payable or not.

A valuable report on the asbestos mines and industry was written for the Dominion Department of Mines in Ottawa in 1905 by Mr. Fritz Cirkel, in which an exhaustive description of the industry is given.

In this report it is stated that the percentage of milling rock in the total rock mined varies between 30 and 60 per cent., and that the percentages of fibre extracted from the rock milled varies between 6 and 10 per cent.

We understood, however, that, owing to the increased uses and demand for asbestos, and the perfecting of the methods of extracting the fibre from the rock, poorer material is being treated, so that the lower figure given above is now probably nearer the average, and old dumps formerly thrown away are now being utilized.

The ore raised from the mine is hand-picked, the long fibre being separated by cobbing, and the rest of the material crushed and treated mechanically. A special method of treatment has been worked out of late years, and now the practice at all the mills is on very similar lines. The first crushing is done by jaw crushers; the material is then dried and further reduced by rolls or rotary crushers. It is then treated in what are called fiberizing machines, the function of which is to beat-out the little lumps of fibre, so that they assume a woolly texture. After that the material passes over shaking screens, and the fibre is extracted from the upper surface by fan suction. Several grades of fibre are made, the largest being spinning fibre, the next roofing and packing fibre, and the lowest paper stock.

To give an idea of the cost of working, some figures are quoted in the report of Mr. F. Cirkel referred to above, which may be reproduced here. The mine chosen as an example is said to have been worked for years on fairly good ground. Quantity of milling material treated per day (day shift only) 80 to 90 tons, being 60 per cent. of the rock mined; production of asbestos of all grades 9.5 per cent. of the rock milled. Working costs, exclusive of management and general charges:—

Per ton of rock mined.....	\$0 53
Per ton of rock milled—	
Mining	\$0 83
Milling	0 80
	— 1 63
Per ton of asbestos—	
Mining	8 86
Milling	8 55
	— 17 41

Mr. Cirkel estimates that if the plant were increased so as to mill 300 tons a day, the costs would be reduced to \$14.50 per ton of asbestos.

In the same report the prices of the different grades of asbestos in 1905 are stated to vary from \$175 to \$200 per ton for the best, down to \$20 to \$25 for lowest quality (paper stock). We understood that a medium quality, with fibre 3/8 inch and under, now fetches about \$40 per ton.

From Thetford we proceeded a few miles to Black Lake station and visited a chrome iron mine, where an irregular mass of chrome iron ore occurs in the serpentine. The ore is crushed in a 10-stamp mill and concentrated on Wilfley tables; the concentrates, we are told, averaged 50 per cent. of oxide of chromium.

From Thetford we proceeded to Montreal, where a banquet was given in our honor by the Montreal branch of the Canadian Mining Institute, and the following day we were driven round Mount Royal and afterwards entertained at luncheon by the Montreal Board of Trade at the Hunt Club.

In the evening we left for Niagara Falls. Here, after seeing the natural beauties of the place, we inspected the three great power stations erected on the Canadian side. The Electrical Development Co., which was first visited, is situated above the Falls. It has the right to 125,000 h.p. This company has adopted the vertical transmission system, in which the turbines are located 136 feet below the upper water level. The power is transmitted directly upwards by vertical shafts to the dynamos at the upper ground level. There are five machines, each developing 13,000 h.p. Each machine takes up 1,200 cubic feet of water per minute.

The Ontario Power Co., whose works are situated below the Falls, has the right to 180,000 h.p. This company takes its water from the river above the former mentioned company, and leads it down to its power station by means of a piep 18 feet in diameter, which is divided on entering the works into 6 pipes, each 9 feet in diameter; 180 feet drop in level is thus obtained. Six machines are installed, each developing 12,500 h.p. The electricity is generated at 12,00 volts and stepped up to 60,000 volts for transmission.

From Niagara we returned to Toronto and, after being entertained at luncheon by representatives of the city, we visited the National Exhibition of Agricultural, Mineral, Industrial and other products of Canada. A specially interesting feature in the exhibition was the collection of mineral specimens from various parts of the Dominion.

From Toronto we proceeded to Cobalt, arriving at that camp on the morning of September the 5th. There our party was split up into several divisions which were taken charge of by a well-organized local committee; a number of the principal mines were visited, the short time at our disposal only admitting of a general idea being formed of what was going on. The local committee very kindly presented our institution with a complete set of local rocks and ores.

The geology of the district, as carefully worked out by Dr. Willett G. Miller, the Provincial Geologist, shows that the formation consists of the very ancient Keewatin Series, consisting largely of igneous rocks older even than the Laurentian granites, as they are cut through by them. Unconformably on these Keewatin rocks, basins and pockets of lower Huronian conglomerates occur in the neighborhood of Cobalt. Around, and in some cases interstratified with the Huronian beds, are intrusions (laccolites) of diabase, the contraction of which, on cooling, is supposed to have caused the cracks and fissures which led to the formation of the silver and cobalt bearing veins.

A recent writer on the geology of the district gives it as his opinion that the Huronian conglomerates correspond with the Dwyka conglomerates of South Africa, and that, like in the latter, the boulders show signs of glacial action. The scattered boulders no doubt are there, but subsequent observers, we are told, have so far failed to find evidences of glacial action on them.

The first discovery of silver ore in this district was on the La Rose vein, so called after a blacksmith in the employ of the railway company during the construc-

tion of the line. We saw the original discovery point, close to the town and near a railway cutting, where immediately below the soil, a narrow vein, rich in native silver, is seen cutting through the hard rock, which is smoothly polished by glacial action.

Before going underground we saw a rich outcrop on a cross vein called "No. 3," which was being uncovered by a longitudinal trench. Here, also, on stripping away the soil, the hard polished bed-rock underneath was seen to be cut through by a vein 6 to 8 in. wide, which, on being cleaned by rubbing, was seen in places to be half native silver.

We then went down to the 80 ft. level on the La Rose vein, where a very fine showing of rich ore was seen. The vein is narrow, rarely exceeding 8 in., and the silver is present principally in the native state, associated with cobaltite and niccolite (kupfernickel) and calc spar.

We also visited the 150 ft. level, where the vein showed a great falling off in value. The main shaft has been sunk deeper into the underlying Keewatin rocks, but we understood the vein has so far not been found to be productive in this formation. The ore is washed and hand-picked at the surface, the picked ore and the fines being sold to smelters in Canada and the United States; the rest of the material is put on the dump, pending the erection of a concentration mill.

We visited the surface equipment of the Buffalo Mine. The treatment process consisted of jaw crushers, rolls and jigs. Finer material was concentrated on Deister tables. The original ore, of value 2,000 to 3,000 oz. to the ton, was hand-picked for direct shipment, and the remainder, together with the country rock which was mined to the extent of 2 ft. on each side of the vein, was sent to the mill. This material is worth about 50 oz. silver to the ton. The vein proper, which is found up to 6 in. in width, consists chiefly of smaltite and niccolite, carrying argentite and native silver.

Coniagas Mine, adjacent to Buffalo Mine, was next visited, and the party conducted through the underground workings by Mr. Leonard, General Manager and part owner of the mine. The surface equipment on this mine followed the same principles as those at the Buffalo. Stamps were also being erected for coarse crushing.

The mine consists of two levels, the first at 75 ft. and the second at 150 ft. vertical. The lower level apparently contains more development than the upper. Some of the workings are termed "drives" and some "cross-cuts," but it appeared that the headings were carried on the veins in all directions, wherever pay ore was found. The ore in the second level was stated to be as good as that in the upper part of the mine, the matrix carrying higher values. The veins proper are calcite in a matrix of diabase and conglomerate.

The actual mineral of the veins is about 1 to 4 in. thick, in two or more stringers. The impression given of the mineral occurrence, was that of a gigantic stockwerk. The veins chiefly run S.E. and N.W. and others cross them at all angles. The Keewatin formation comes in under the conglomerates, and, when that makes its appearance, all values are cut out.

In the afternoon of the same day we visited the Lawson Mine, about two miles distant from the town of Cobalt, where work was just commencing. A trench along the outcrop disclosed, when the soil was stripped away, a rich outcrop for a considerable distance.

Near here we also visited the Crown Reserve Mine, where we saw a marvellously rich collection of hand-picked ore in the cobbing shed. We went underground

to the 80 ft. level and saw some very rich breasts of ore and understood that some \$500,000 worth of ore had been taken out of a small working down to this depth. Rich ore had recently been struck in a shaft 190 ft. distant, and interesting calculations were being made as to the probable value of the ground between the two points.

The ores of Cobalt are not only remarkable for the association of silver with cobalt and nickel, but also for their richness in native silver. At one mine we visited we were told the shipments were averaging 2500 oz. of silver per ton, and instances were mentioned of still higher values being sent from various mines. Other cases are quoted where carload lots of 30 tons have averaged 6000 to 7000 oz. and in one case as high as 38,000 oz. per ton. [The authors hardly mean this.]

Seeing the hard unaltered bed-rock cut smooth by glacial action immediately underneath the soil, with the vein running through it showing very few evidences of chemical action, brought out strongly the fact that the usual decomposed surface rock, together with the gossan of the veins, had all been planed off and carried away, and the general freshness, both of the rock and of the vein matter, suggests that the blanket of ice has not long been withdrawn. The fact that the veins generally occur in patches and basins of Huronian rocks, which are underlain at no great depth by the Keewatin series, raises the very important question as to the behaviour of the veins in passing from the Huronian into the Keewatin series.

It is recognized that, in the neighborhood of Cobalt, the veins in the Huronian beds have, so far, become impoverished on approaching the Keewatin, and are unproductive on penetrating these rocks. On the other hand, cases were given of productive veins in the Keewatin formation altogether, notably at Temiskaming. Owing, however, to lack of time, we were not able to look further into this very interesting question.

The output of the mines of Cobalt, for 1907, is estimated by the Bureau of Mines of Ontario to have had a value of \$5,900,000, and, from what we saw both of the reserves of rich ore in the older mines, and of the rich outcrops not yet developed to any great extent, there is but little doubt that the district has a period of great prosperity ahead of it.

We heard a good deal of talk of promising finds being made in new localities, but time did not admit of our going to see them, much as we should have liked to do so.

We spent a Sunday at Cobalt, and were taken a very pleasant steamer excursion to Lake Temagami, where we landed and visited a large outcrop of iron ore, consisting of a banded formation of magnetite and jasper. The ore was stated to average low in iron—only some 30 per cent.—but it was suggested that, some day, such ore might be rendered suitable for smelting by concentration, as the supplies of iron ore do not seem likely to become more plentiful as time goes on. The interesting statement was made that experience with banded iron deposits in the Lake Superior region has shown that the outcrop ore is sometimes higher in silica than the normal ore in depth proves to be.

In our trip on the lake we passed and observed with much interest an old Hudson's Bay Company's post. It appears that the old route into the northern interior used to pass along this lake up to Lake Temiskaming, the shore of which is within about four miles of Cobalt. It was pointed out that this route has been constantly travelled by white men for 200 years, and that it was not until the railway was built, about five years ago, that the

mineral riches of the locality were suspected, showing what possibilities lie in the vast little-known regions of Northern Canada.

After leaving Cobalt we proceeded to where a branch of the main line conveyed us to Moose Mountain. Here the iron mines were the point of interest. The deposit consists of big magnetite masses running through the Keewatin near the granite contact. The deposits also extended as outliers in the granite. One of these had been extensively opened out by quarry work, and was being put into shape for loading into trucks at the adjacent rail head. The outcrop extended some distance into the forest, and the deposit was evidently of considerable

magnitude. The mining company was said to have a contract with the railway company for the carriage of up to 500,000 tons of ore a year to Key Harbor, in Georgian Bay, a distance of 81 miles, for 65c a ton. The grade of the ore is: Iron, 54 per cent.; silica, 12 per cent.

Leaving Moose Mountain, we looked at a small gold placer outfit on the Vermilion River. The material treated had the appearance of secondary deposition as moraine matter, and covered the surface of the country round the river banks. It consisted of granite and diabase pebbles lying loosely among earth and sand. Some small stuff, roughly panned, showed gold, but no work was going on at the time of our visit.

(To be continued.)

THE REPORT OF THE GERMAN DEVELOPMENT COMPANY, LIMITED.*

II.

1908.

Report on Mining Claims in the Montreal River Mining Division by Alfred E. Barlow, M.A., D.Sc.—

From the tone of Dr. Barlow's references to the Montreal River district, it is evident that he is deeply impressed with its importance and is most sanguine as to its future. In his report for 1908 he urges the construction of the branch railway line from Charlton, through Elk City, to Gowganda Lake on the east branch of the Montreal River. He notes the improvement that was made in river transportation during last season, but indicates that, in his opinion, there is peremptory need for rail communication.

The rush to the Miller Lake and Gowganda areas began early in July. A gasoline launch carried passengers from Elk Lake to the east end of the Long Portage, a distance of about twelve miles. Here the canoe route to Bloom, Everett, Miller and Gowganda lakes begins. A portage of two miles brings the traveller to Stoney Creek. Portage, Birch and Pike lakes are passed and the outlet of Bloom Lake is reached. The last named lake is one of a chain in which Wigwam, Lost and Calcite lakes are links. From the beginning of the portage to Bloom Lake the whole distance is about fifteen miles.

Further details concerning the summer and winter routes are followed by description of mining locations and work performed. Incidentally, Dr. Barlow commends the action of the Provincial Government in removing the Mining Recorder's office from Latchford to Smyth.

The geology of the Miller and Everett Lake Mining District, Dr. Barlow states, is almost identical with that of the region surrounding Cobalt. East of Miller Lake, Keewatin is largely represented with smaller masses of intruded (newer) diabase.

To the north the newer diabase contains small included areas of Keewatin, made up, as usual, of different varieties of green schists and altered diabases. The Lower Huronian is composed of slate, conglomerate, and quartzite, in ascending order.

All of the ore bodies occur in the form of veins cutting chiefly the quartz diabase; but, also cutting the

quartzite, conglomerate and the green schists and diabases of the Keewatin formation.

While there is no indication of systematic arrangement of the fissuring, some of the more important veins have a north and south direction. The veins vary greatly in width and in vertical and horizontal extension. Those from 2 to 6 inches wide are most common and are apt to be richest. The gangue minerals are chiefly calcite and quartz, the former being by far the more abundant. The so-called "aplite" dikes, cutting the diabase, show a fine to moderately coarse-grained feldspathic material varying in color from pale pink to deep flesh red. "These dikes are in reality a 'diabase pegmatite' having the same genetic relationship to diabase that ordinary pegmatite has to granite. Chalcopyrite is perhaps the most usual and abundant of the metallic constituents, but pyrite, hematite, smaltite, and niccolite, with blooms usually accompanying these two last mentioned minerals, are also very common. So far (late in 1908) no vein with visible silver has been found on claims belonging to this company." To the west and southwest, however, rich silver veins were found on other claims, and northwest, on the Long claim, an aplite dike 12 inches wide showed abundant silver.

Dr. Barlow's report concludes with an expression of high hopes in the ultimate discovery of silver in quantity.

1907.

Report on Bighorn, Brazeau and Saskatchewan Coal Lands by D. B. Dowling.

In 1907, Mr. D. B. Dowling, whose work in the western coalfields has attracted much attention during the past few years, chose for the German Development Company three locations. These, Mr. Dowling asserts, are the best in Northern Alberta. They are all on the eastern flank of the Rocky Mountains. The lands were purchased from the Dominion Government.

The Brazeau location is within 65 miles of the projected G. T. P. Railway line, through the Yellow Head Pass. It is 115 miles west from the Calgary and Edmonton road and about 80 miles north from the C.P.R. station at Laggan. The property is four miles long and one mile wide.

*See Editorial in issue of Jan. 1, 1909.

Sixteen miles to the southeast lies the Bighorn area on a branch of the Saskatchewan River. It contains five square miles.

The Saskatchewan location (320 acres) on the south side of the stream is three miles distant from the Bighorn property.

Although in the mountains southward for 100 miles the coal is semi-anthracite, the coal found in these areas is all bituminous and makes good steam coal. Unlike the Canmore coal, it can be coked.

The three fields are situated on one continuous series of rocks, forming a continuous band about 2,000 feet thick from the Saskatchewan northward to near the main part of the Brazeau River. They lie against the tilted limestones that form here the Bighorn Range. The beds dip from 30 to 40 degrees from the horizontal toward the south-west, and they can be traced almost continuously. Although there is, no doubt, coal in this strip at any portion, still the topography of the country limits the field to such areas as can be approached by railway.

The choice of areas was strongly influenced by considerations bearing on transportation. Mr. Dowling chose for purchase in the three localities such areas as would, as far as possible, cover the portions on which the coal could be attacked cheaply from the surface, leaving for outsiders the portions that would entail great expense for operating.

Most of the coal lands produce only a lignite coal varying in grade from very poor quality in Manitoba to a fair domestic fuel near the mountains. These coals are very light when partly burned and their use on railway engines is prohibited as they start forest and prairie fires.

The lowest horizon is the richest and best, and is brought to the surface only in the folded and faulted country close to the Rocky Mountains. These areas are limited. Their coal content is remarkably uniform. As a rule, less coal is to be found toward the east. In a north and south direction the coal content is fairly constant. Thus at Coleman there is a total of 125 feet coal. On the main line C. P. R. the measures have about 100 feet of coal. Half way north to the Saskatchewan there is 115 feet. So that when 70 feet of coal is found at the Brazeau, there should be no loss of coal in the short distance south to the Saskatchewan River.

The conclusions drawn by Dr. Milton L. Hersey, Montreal, from analyses conducted in his laboratories, are included in Mr. Dowling's report.

Dr. Hersey points out that the very low percentage of sulphur found in the samples submitted to him, indicates that the coke obtained from these coals will be particularly suited to the smelting of iron ores. Nova Scotian coals average about 13,500 B. T. U. Some of the best samples from Big Horn River yielded 14,000 B. T. U. Two samples yielded from 10,000 to 11,000 B. T. U. per lb., which proved them to represent saleable fuels. The rest yielded from 12,000 to over 14,000 B. T. U. All coked except one.

Comparing the samples under consideration with many of the western and eastern fuels that had been analyzed in his laboratories, Dr. Hersey states that the average volatile combustible matter in coals from the Canmore district is 16 per cent.; from Nova Scotian coals, about 35 per cent.; from the above mentioned samples, about 25 per cent. Fixed carbon in the Canmore coals averages about 74 per cent.; in Nova

Scotian coals, 55 per cent.; in the samples analyzed, about 63 per cent.

The ash reported ranges from 27.02 per cent. to 4.60 per cent. Most of the samples are well under 10 per cent. The larger seams are all of low ash content. The high figure quoted above is from a sample of a dirty seam.

A rough approximation using 60 feet for maximum thickness gives 56 million tons per square or a total of 224 million tons of excellent steam coal for the four mile Brazeau area.

On the Bighorn River area, on which is a natural water-power, three seams were measured, two of 4 feet each and the lowest 6 feet. The top seam was high in ash, the lower two were fine bituminous coal yielding a firm, strong coke. A rough estimate gives a total of 10 million tons per square mile for the three seams together. This does not take into account other known seams nor seams as yet undiscovered.

The Saskatchewan River location offers, Mr. Dowling asserts, "the best example I can show of a small area commanding the approach to all the adjacent coal seams."

Mr. Dowling's estimate for tonnage, as far as the three districts have been prospected, shows a total of about 279 million tons.

Notes on the demand for the coal, on competing mines, a table of distances from mines to Edmonton, Calgary, and Innisfail, and a few general notes conclude this section of Mr. Dowling's well-constructed and most interesting report. A diagram, in which the coals from the company's lands are compared with other Canadian and United States coals, is appended.

In our next issue we shall summarize Mr. Dowling's description of the Kananaskis coal area, and Mr. James McEvoy's report on the same lands.

CARBONS (BLACK DIAMONDS) FOR DIAMOND DRILLS.

By Jacques Baszanger.

Carbonado, or black diamond, is one of the hardest substances known, being sometimes harder than the crystallized diamond. It is, however, unsuitable for cutting into gems, because of its opacity, and its being amorphous. Carbonado was first successfully used by the French engineer, Lehot, in the drills for boring holes for blasting in the St. Gothard tunnel. At present, carbonado is largely employed in diamond drilling, in connection with which it is one of the principal items of cost.

Carbonado is obtained in the Province of Bahia, Brazil, in La Chapada and Lavras districts, where it is mined from stream beds and other alluvion. The miners sell their find to agents of exporting firms in the city of Bahia.

Some very large stones have been found, among others, one of 1,100 karats about 25 years ago; also one of 1,700 karats, and in 1895 a gigantic stone of 3,078 karats or 615 grams, which was purchased as well as broken up by me personally into pieces of suitable size for diamond drills, a special machine being devised for the purpose. This stone was purchased for \$32,000; at the present time it would be worth \$261,630. Several stones of 400 to 800 karats have been discovered during the last ten years, and stones of 100 to 200 karats are frequently found.

Previous to 1870, carbonado was practically valueless. From 1870 to 1872 it was employed as an abrasive for cutting and polishing the white gems and thousands of karats were sold at 50 cents per karat, to be crushed into powder for this purpose. A few years later, when carbonado was employed in diamond drilling, it sold at \$2 to \$4 per karat, and then rose gradually to \$10 per karat, at which price it remained until 1895, after which it advanced by leaps and bounds to \$50 per karat. The price fell back to \$25 per karat, but rose again to \$85 per karat, at which figure it now stands; from present indications, a further advance is expected. The situation is due to the decline in the supply of

carbonado during the last ten years, while the demand has increased. When diamond drilling is resumed more extensively on the Rand, it is expected that it will be even more difficult to supply the demand for carbonado.

Bearing upon this subject of diamond consumption in drilling, it is interesting to remark that in putting down the drill hole at Rybnik (Paruschowitz), Upper Silesia, which attained a depth of nearly 7,000 feet, upward of \$25,000 worth of carbon was consumed. The carbon settings for a drill-bit are expensive. Bits as large as 1 foot in diameter, set with \$5,000 to \$8,000 worth of carbon, are frequently employed in Europe.

REPORT ON THE MINING AND METALLURGICAL INDUSTRIES OF CANADA, 1907-8.

Issued by the Mines Branch, Department of Mines of Canada.

A REVIEW.

To compile a directory of the mining and metallurgical enterprises of Canada is what the Mines Branch, under the direction of Dr. Eugene Haanel, set out to do early in 1907.

A special staff of investigators was appointed to collect data in the respective provinces, the members of which were assigned thus:

Yukon Territory—D. D. Cairnes.

British Columbia, Alberta, Saskatchewan and Manitoba.—R. R. Hedley.

Ontario.—Fritz Cirkel and J. J. Bell.

Quebec.—J. W. Bell.

Nova Scotia and New Brunswick.—W. F. Jennison

Definite instructions were given that only producing mines, or mines that were about to make shipment, and metallurgical plants in active operation, were to be reported upon. It was further understood that all information was to be secured at first hand by means of personal interviews and visits.

In addition to the material collected by the above-mentioned staff, several members of the Geological Survey, including Director R. W. Brock, contributed descriptions of special sections. Dr. Haanel in his introductory note refers in most appreciative terms to the manner in which Mr. S. Groves, editor of all the Department's publications, arranged, revised and edited the bewildering mass of material submitted to him.

The Report contains 936 pages of text, wherein are described or mentioned practically all the operating metallic and non-metallic mineral mines of the Dominion; and the metallurgical, clay, and building stone industries. Mineral maps of all the provinces, along with 144 half-tones and diagrams embellish the volume.

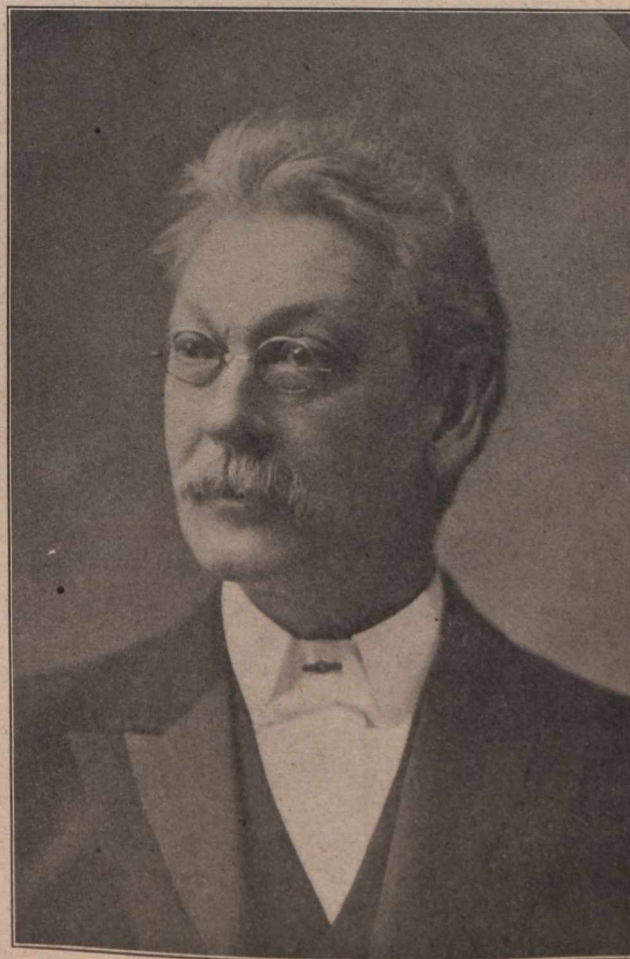
Historical notices of the more important branches of the industries in each province are given.

The capitalization and personnel of each organization or company is also mentioned. In the index, about 1,500 names of owners or companies are recorded.

Wherever practicable, details of construction, methods, and costs have been included.

Part I. Yukon Territory.

In this section, an historical sketch is followed by a short discussion of the methods of placer mining including an extract from a paper by Mr. J. B. Tyrrell, and a note on lode mining.



DR. EUGENE HAANEL, Director Mines Branch, Department of Mines, Ottawa.

We note that, in June, 1908, there were 58 dredging leases, comprising 304 miles of submerged beds of rivers in the Yukon Territory. Twelve large dredges (3,000 cubic yards capacity each) were then in commis-

sion and more were added to the list before the season closed. At Whitehorse a considerable number of copper mines were being worked. At Tantalus and at Sourdough, coal, retailing at from \$15 to \$18 per ton, was being produced.

The equipment, properties, and personnel of the dredging, hydraulicking, and other companies are then detailed. In each case the names of members of the directorate, or of owners, the share capitalization, place of registration, and the country under whose laws the company is incorporated, are mentioned.

Half-tones and an excellent mineral map illustrate the text.

British Columbia.

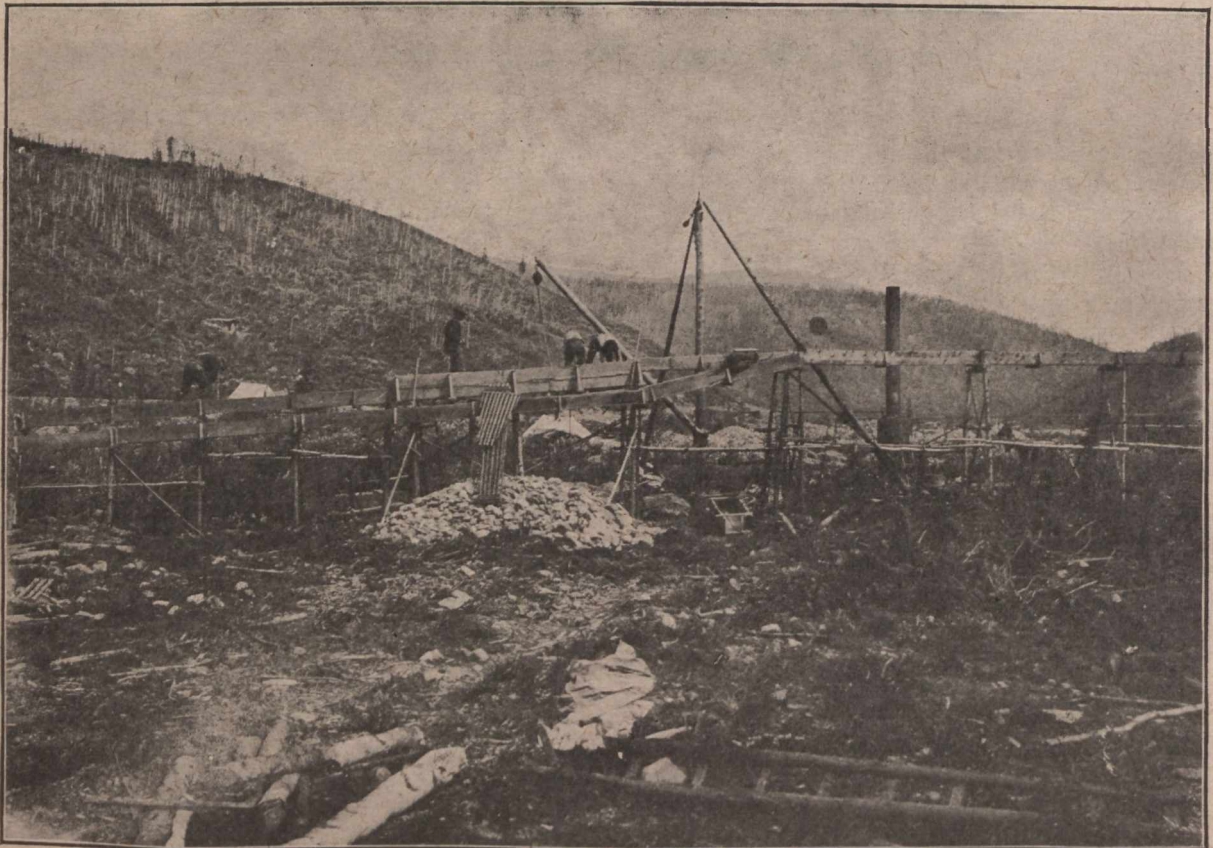
This westernmost province receives its full share of attention. About 200 pages are taken up with its various mining activities. Preliminary notes on placer mining, lode mining, coal, coke, recent development and

a bid for a share of the increasing demand for mining machinery.

Southeastern British Columbia has been prominently brought before the public for some years. The notice given in the report to Atlin and other northerly sections will aid in advertising these undeveloped countries.

Alberta.

The coal of Alberta, at present its chief mineral resource, occupies most of the space devoted to this province, although both natural gas and gold receive mention. "In some parts of Alberta almost every rancher is the proprietor of a coal mine; which fact renders the task of securing or compiling accurate statistical data . . . a matter of unusual difficulty." So, also, it indicates the tremendous extent of Alberta's coal deposits, which, when the projected trans-continental railways shall have been developed, will undoubtedly



"Clean Up," Hunker Creek, Y.T.

progress, labor conditions, are followed by ample data concerning the companies engaged in mining gold, gold-copper, copper, silver-lead, zinc, and iron. Power development on the Kootenay and Kettle rivers, a full descriptive list of smelters, and an adequate section on operating coal mines, complete this division.

The full information provided as to the nature and extent of corporate enterprises, particularly of such concerns as the Consolidated Mining and Smelting Co., the British Columbia Copper Co., the Granby, etc., and of the mines, large and small, will prove particularly advantageous to eastern manufacturers. British Columbia is not yet a large manufacturing province. Most of the machinery brought into the province is manufactured elsewhere, in Canada, Great Britain, or the United States. The list of possible customers given here will unquestionably encourage manufacturers to make

contribute largely to the coal production of Canada.

The list of operating companies and the facts concerning analyses, etc., are most impressive. The large land holdings of many of the companies promises well for their development.

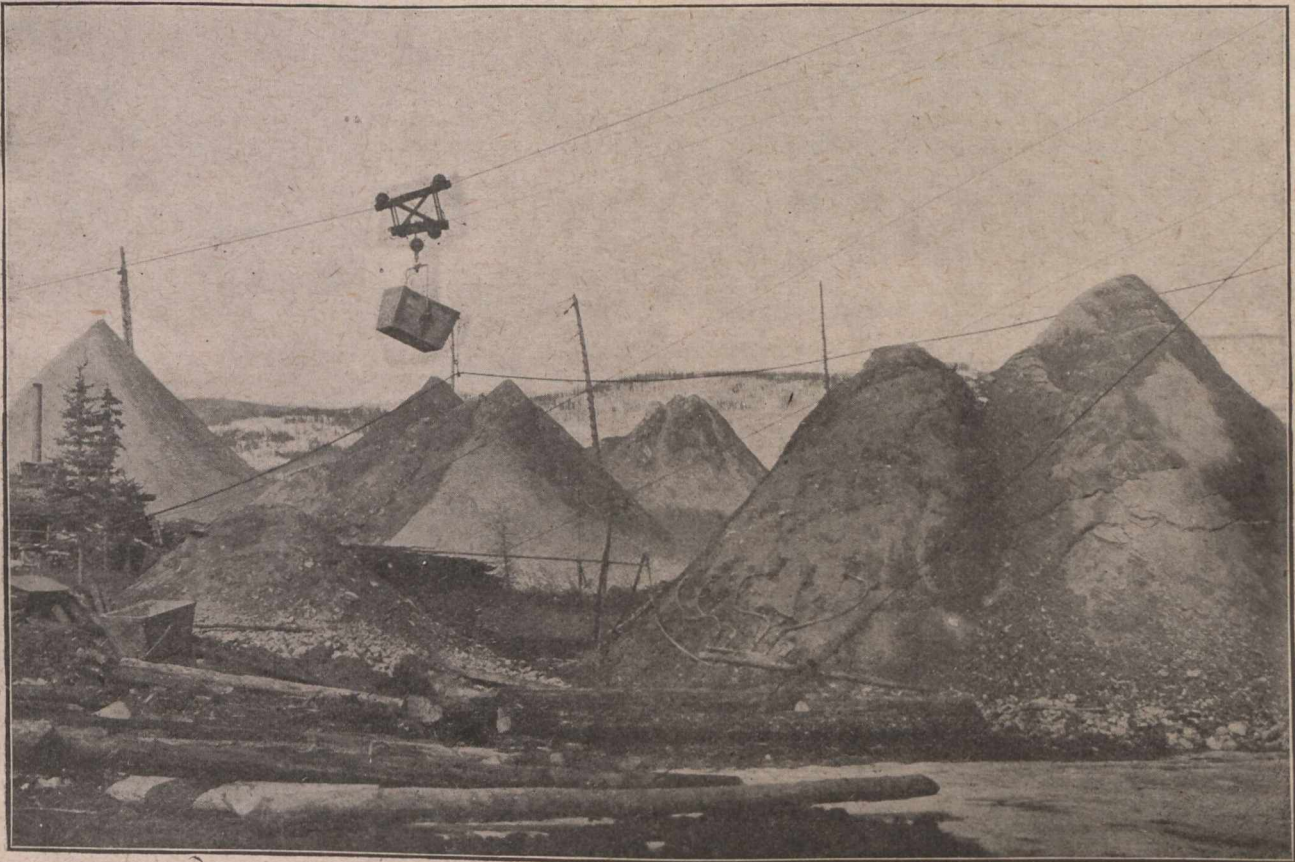
Concerning natural gas there is a brief note by Mr. Eugene Coste. It is appropriate to mention here that just as this review is being written, news has come that the C.P.R., under the direction of Mr. Coste, has struck an enormous flow of gas at Bow Island.

Saskatchewan.

Three coal-mining companies are listed for this province.

Ontario.

This section opens with an historical and statistical outline by Mr. H. Mortimer Lamb. Then follow classi-



Automatic Dumping, Gold-Run Creek, Y.T.



Laurentian Gold Mine—100 Miles East of Kenora, Ont.

fied list of operating mining and smelting companies. Included in these is a 9-page description of the Canadian Copper Company's plant. Iron, copper and nickel, gold, silver, zinc, lead, iron pyrites, graphite, mica, talc, corundum, salt, peat, petroleum, oil and natural gas are dealt with.

We note the omission of mention of feldspar mining. This is an oversight that should be rectified. About 140 pages are given to Ontario. The text will require large additions in the next edition of the volume particularly in view of the expansion of mining activities at and about Cobalt.

Quebec.

The pages that deal with the asbestos industry are the most valuable of this section. It comprises a brief historical and statistical summary, a short article upon the geology and uses of asbestos, along with the usual list of companies, etc.

Nova Scotia.

This province comes next, the order from west to east being broken by placing the chapter on Nova Scotia ahead of that on New Brunswick. The arrangement of subjects in this chapter is slightly heterogeneous. Historical notes on coal mining are succeed-

ed by these subjects: antimony, gold, iron and steel, coal, statistical review. The information concerning gold mining is well selected, displaying costs, methods, wage rates, etc. The Dominion Iron & Steel Company's plant is well described. So also are the other iron and steel plants.

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In the matter setting forth the holdings and equipment of the Dominion Coal Company there is included the text of the agreement signed in 1904 by the Dominion Coal Company and the Provincial Workmen's Association. This, we think, is hardly needed. Indeed, it is obviously out of place.

New Brunswick.

The Imperial Coal Company and the Canadian Antimony Company are the only concerns touched upon. The province's coal, manganese, iron, copper and antimony resources are noted briefly. A complete statistical review of Nova Scotia's mineral production concludes Part I.

Part II. Structural Materials.

Taken up in order, from west to east, the brick, tile, sand-lime brick, sewer pipe, building stone, artifi-

cial stone, limestone, cement, plaster, pottery, ochre, gypsum and such industries, are written up in the same way as are the general mining and metallurgical industries in Part I.

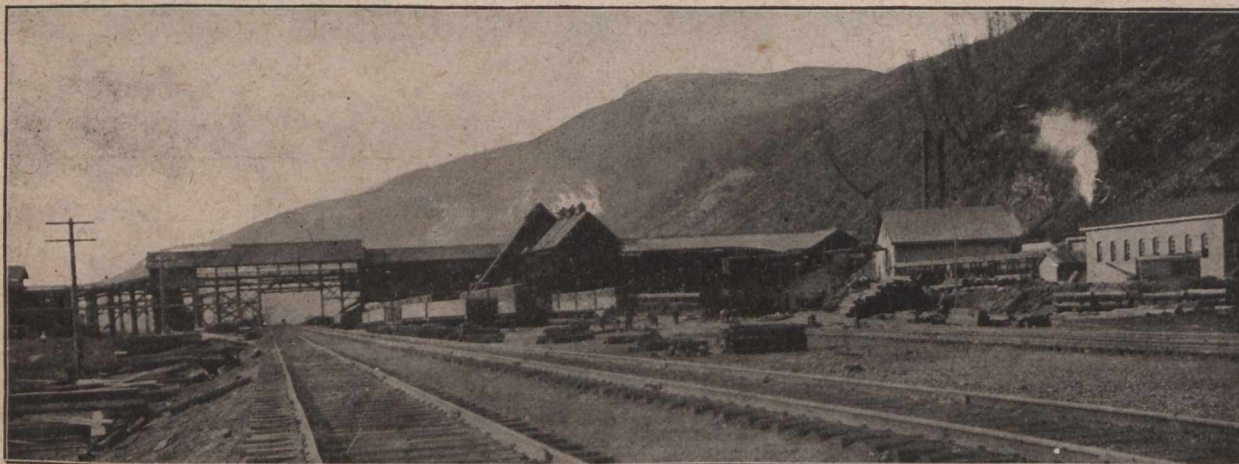
Wherever practicable the capacity and equipment in all cases of the brick and tile plants are specified. The list of these and kindred plants is impressive.

General Remarks.

In outlining any company's operations the method followed is roughly thus:

Name.
Date of Incorporation.
Details of Capitalization.
Locality.
President and Directors.
Superintendent.
Place of Registration.
Head Office.
Number of men employed.

The space assigned to one enterprise is more or less commensurate with its importance.



Michel Colliery, Michel: Crow's Nest Pass Coal Co., Fernie, B.C.

It must be borne in mind that this is a first attempt. As the work goes through its annual editions, improvements and changes in matter and form will of course be made. Meanwhile, it is not out of place to offer a few criticisms and suggestions.

The first impression that one receives is that the book is of unweildy bulk. As it contains well nigh 1,000 pages and many maps and diagrams, this is to be expected. But the fact that it is difficult to handle suggests dividing it into two volumes. This could be easily done by binding separately Part I. and Part II.

Another suggestion is that the matter of permanent interest, such as the remarks about the geology, etc., of the districts of each province, be thrown together in the front of the volume, and that the lists of companies, etc., which will have to be changed and added to each year, be printed in smaller type and placed at the back of the volume. Some such arrangement as this would reduce the size of the book and would facilitate changes.

One suggestion more and we shall close. For the benefit of readers a satisfactory bibliography should be appended to each chapter.

ONTARIO BUREAU OF MINES IN 1908.

Written for the Canadian Mining Journal by
T. W. Gibson.

The Act of the Legislature which created the Bureau of Mines defined its object to be to "aid in promoting the mining industry of the Province." Just how that aid was to be given was left entirely to those responsible for the Bureau's management. It can fairly be said after seventeen years that the Bureau has justified its existence. It has shown its usefulness in many ways and sometimes in signal fashion. Doubtless its principal function is to furnish information—statistical, geological and mineralogical. Such information must be both timely and reliable.

Hitherto the Bureau has acted upon the belief that a post mortem examination, say, of a mineral district, with nicely worked out and critical details, is of less importance than a preview, even if bold or rough in outline, which will be of practical benefit to those actually engaged in exploiting such a field, or in establishing a new industry. The treatment of the Cobalt silver camp illustrates the working of this principle. It was the Bureau that first acquainted the public with the wonderfully rich discoveries of silver at Cobalt; the fact is that some of the original discoverers themselves did not know they had found silver, until Professor Miller, the Provincial Geologist, apprized them of the truth. This was just before the snow fell in the winter of 1903, and early next spring the Bureau's geologists and surveyors were in the field working out the geology and ore relationships, a task which they accomplished in such a way that the classifications and conclusions reached in a season's examination have stood ever since practically unchallenged, and prospectors went into the field in the spring of 1905 with a geological map and report of the greatest practical use to them in their labors.

During 1908 the attention of the Bureau was directed largely to outlining extensions of the silver-bearing field and defining new ones. In the unsurveyed territory south of the Township of Lorraine, now generally called "South Lorraine," the geology, which is largely similar to that of the Cobalt proper, has been worked out in sufficient detail to enable a map of the district to be prepared, which with a brief report on the field will be published next spring. The Montreal River district, especially the Miller and Everett lakes region, and the Gowganda country, has been treated in similar fashion, and will likewise be the subject of a geological map and report. Mr. A. G. Burrows has had charge of this work, assisted by Mr. R. B. Stewart.

The Gillies limit, which two or three years ago loomed up large in the excited atmosphere then prevailing, has also been subjected under the direction of Mr. James Bartlett to close examination, not confined to the portion known to carry silver-bearing veins, but extending over a great part of the hundred square miles of which the limit is composed.

But silver is not the only metal that the pre-Cambrian rocks of Northern Ontario contain. Iron is even more important than silver, and for several years Dr. A. P. Coleman and Mr. E. S. Moore have been investigating the extensive iron ranges which run easterly from the east shore of Lake Nepigon. On these banded ranges not many bodies of workable ore have yet been found, but there is ground for hope that closer and deeper probing by means of the diamond drill may show that as in the United States Lake Superior fields the

banded ore on the surface is occasionally underlaid by higher grade material at depth.

The iron and steel industry is of prime importance to the country, and was dealt with at length in the Bureau's Seventeenth Report, in which Mr. George C. Mackenzie not only described the condition of the industry in the province, but made a valuable contribution to the information bearing on the concentration of low-grade ores by magnetic processes. Mr. Mackenzie is continuing during the present winter his experimental work on the sulphurous and silicious ores of Eastern and Northern Ontario with a view to determining the best methods of fitting them for utilization in the blast furnace.

It must not be supposed that Northern Ontario contains all the minerals of value in the Province. The fact is that the stratified limestones of the southwestern peninsula carry much wealth in the form of petroleum, natural gas and salt, to say nothing of stone for construction purposes and lime, or of the deposits of brick clay and cement marl which overlie them. The petroleum fields of Tilbury East and Romney, described by the Bureau in a recent report, have given a new lease of life to the oil production of Ontario, and the gas strikes of Haldimand and Kent Counties have brought the advantages of this ideal fuel within the reach of hundreds of thousands of people in this most thickly settled and oldest portion of the province. One result of the work of Mr. G. R. Mickle, mine assessor, has been to put a stop to the criminal waste of natural gas which was going on in these gas fields. However, large a supply of natural gas there may be in any locality, it is strictly limited in quantity, and when it is gone there is an end of it. Anything that will tend to prolong the supply is a public benefit.

In addition to exploring and making known mineral resources of the province, the Bureau of Mines is charged with the duty of enforcing the regulations provided by the Legislature for the protection of workmen in operating mines. There has recently been a serious epidemic of accidents in the mines of Cobalt. The chief classes of accidents have been due to explosions and to falling of men from buckets. When analyzed, it is found that the number of openings and the large quantity of shaft sinking that is done have a direct bearing upon the frequency of these accidents. Explosives of the gelignite class seem to be proving themselves dangerous in the severe weather in winter. Hoisting men in buckets is forbidden by the law, but miners dodge the ladderways and persist in taking the easier but more dangerous route to the surface, via the bucket. Frequent warnings proving unsuccessful in stopping such practices, prosecution of offenders has been begun. It is sincerely to be hoped that mine owners and miners will combine to eliminate all unnecessary risks from the business of mining, which at the best is more or less hazardous.

THE PROGRESS OF THE ELECTROMETALLURGY OF IRON AND STEEL.

Written for the Canadian Mining Journal by Dr. A. Stansfield, McGill University.

In reviewing the progress of electrometallurgy during the past year one is struck more by the steady improvement in certain branches than by any very startling inventions. The application of electrically generated heat to the production of iron and steel is one of the

most recent, and is becoming one of the most important branches of electrometallurgy, and it is here that improvement in design and increase in the size of furnaces is most marked.

The most successful application of the method of electrical heating to the metallurgy of iron and steel has been in the production of high grade steel, in the electric furnace, either by melting pure materials as in the manufacture of crucible steel, or by melting and refining steel scrap, pig iron, etc., as in the open hearth process. Two types of electrical furnace have been employed, the Heroult furnace and the induction furnace. The Heroult furnace is provided with two vertical carbon electrodes and the heating is mainly affected by electric arcs between these electrodes and the surface of the molten material in the furnace, while in the induction furnace the steel is contained in a ring-shaped trough forming the short-circuited secondary winding of a transformer, and is heated by the electric current which is induced in it. The Heroult furnace resembles the open-hearth furnace in shape and the molten steel which it contains can be readily and completely refined by additions of iron ore, lime, etc., to the slag floating on its surface. The induction furnace with its narrow trough does not lend itself so readily to the refining process, and its use has been restricted mainly to melting pure materials as in the production of crucible steel.

The Kjellin, Colby and other of the original types of induction furnace consisted of a rectangular iron core with a primary winding connected to the electrical supply, and a secondary, which consisted of a circular trough containing the metal to be melted. The primary and secondary were sometimes on the same limb of the core, and at other times on opposite limbs. A combination of these arrangements consists in placing a primary and a secondary on both of the vertical limbs of the core, the secondaries meeting in the middle of the furnace, thus forming a figure 8. The Roechling Rodenhauser furnace is developed from this by enlarging the central part of the channel, and by providing an auxiliary supply of heat for this part of the furnace, which would be insufficiently heated by the current flowing through the narrow secondary circuits. The auxiliary supply of heat is obtained by means of metal electrodes, which are connected to secondary windings of one or two turns on each of the vertical limbs of the core. These electrodes do not enter the molten metal in the furnace, but are separated from it by a thickness of magnesite bricks which form the lining of the furnace. These bricks are non-conductors of electricity when cold, but at the temperature of the steel furnace they conduct sufficiently well to convey the auxiliary heating current from the electrodes to the molten metal. This construction provides a central space in which the refining of the molten steel can be effected, and it also increases the capacity of the furnace without the serious lowering of power factor that attends an increase in size in the simple form of induction furnace.

The furnace described above is operated by single phase current, but by using a core having three limbs, three phase current can be used and the furnace is then more readily adapted to the ordinary conditions of electrical supply. The three-phase furnace has the incidental advantage of producing a circulation of the molten steel, thus insuring a uniform composition.

These furnaces are largely used for finishing steel that has been made in the Bessemer converter or open-hearth furnace. Such steel has had the greater part of the impurities removed and the duty of the electric furnace is to eliminate the final traces of phosphorus and

sulphur, to remove the whole of the dissolved oxide of iron and, finally, to adjust the composition to that required in the finished steel. For work of this class induction furnaces of about 1,000 h.p. require a power of about 90 k.w. per ton of capacity and consume about 150 to 200 k.w. hours per ton of output.

Compared with the open-hearth furnace, the electric steel furnace has the great advantage of being able to remove completely the oxide of iron and dissolved gases, thus getting a sound steel. The phosphorus can be eliminated very perfectly by repeated washing with fresh basic slags, which are then removed, thus enabling the steel to be deoxidized in the furnace without throwing back the phosphorus into the steel. In the basic open-hearth furnace great difficulty is experienced in removing sulphur at all completely because its removal in the presence of iron oxide is scarcely possible. In the electric furnace the phosphorus is first removed, the steel is then deoxidized and the sulphur eliminated as calcium sulphide by reactions similar to those employed in the blast-furnace. The Roechling-Rodenhauer induction furnace are used at the Roechling works in Voelklingen, Germany, and more than 1,000 tons of steel rails had been made in their three-phase furnaces and sold to the German Government before last August.

The Heroult steel furnace is in use in a number of steel plants, mainly for finishing steel that has been made in the basic open-hearth or other steel furnace. They are usually made with a capacity of from 1 to 5 tons. The Girod furnace resembles the Heroult furnace, but it has in addition to the carbon electrodes a number of iron electrodes embedded in the hearth of the furnace. The carbon electrodes in this furnace form one pole, while the iron electrodes form the other pole of the furnace.

A furnace devised by Professor B. Igewsky, of Kieff, Russia, depends entirely, as the Roechling-Rodenhauer furnace does in part, on the conductivity of heated bricks. The furnace is a rotating drum of firebrick, having thin iron plates laid between the courses of bricks and connected to the sections of a commutator in such a way that an electric current is caused to flow part way around the drum. In this manner the drum and the contained steel or iron is heated and melted. This furnace is only in the experimental stage.

The Lash process for making steel in the open-hearth or electric furnace is intermediary in its action between the ordinary open-hearth process in which pig iron is refined by the action of iron ore from which a certain amount of iron is incidentally reduced by the action of the metalloids in the pig iron, and the electric process for the smelting of iron ores in which carbon is the reducing agent. In the Lash process, iron ore, carbon and shotted pig iron are heated together in some form of furnace such as the Heroult Steel furnace, yielding ultimately steel of good quality. The process will require less electrical energy than the direct reduction process in proportion as more pig iron is used in the charge, but no doubt the pig iron has a physical as well as a chemical use in facilitating the heating and reduction of the ore mixture. In a recent paper by Mr. F. A. J. Fitzgerald it is stated that 50 tons of steel have been made by the Lash process in a Heroult electric furnace at Niagara, 60 per cent. of the charge being iron ore, 23 per cent. cast iron (in the form of borings or shotted pig iron) and the balance being fluxes and carbon. The energy consumption was about one-quarter h.p. year per ton of steel.

With regard to the processes for the direct reduction of iron from the ore in an electric furnace yielding pig

iron or steel, there appears to be nothing to report. Last April a new experimental furnace at Heroult-on-the-Pitt was reported as having been running continuously for several days, turning out over a ton of pig iron per day, but an absence of further reports may be taken to indicate that difficulties have been encountered and have not yet been overcome. The Stassano steel furnace, originally intended for the production of steel direct from the ore is now used for making steel from pig and scrap; a furnace of 1,000 h.p. consuming some 1,000 h.p. hours per ton of steel made from the cold charge.

BOOK REVIEWS.

The Commercial Handbook of Canada, 1909, Fifth Year; Heaton's Annual. Edited by Ernest Heaton, B.A., (Oxon.) Barrister-at-Law, and J. Beverley Robinson. Price, \$1.00. Published in December by Heaton's Agency, 28 Wellington St. East, Toronto.

The Commercial Handbook is designed to present concisely all information that any man of affairs needs in the course of his daily routine. As a directory it contains the names of all Government officials, members of legislatures, postal information, transportation, banking, legal, and other directories, along with customs regulations, etc.

The second part is a digest of the latest official reports of all the industrial activities. A few pages are given to a list of operating mining companies, etc. The "Boards of Trade Register," revised to date, contains a succinct description of every noteworthy town in Canada. In many cases the opportunities offering for manufacturers and investors are noted.

A number of exchange and miscellaneous tables are appended.

A most useful cipher code appears on pages 60 and 61.

Heaton's Commercial Handbook should be of immense value to all mine managers.

Quarterly Bulletin of the Canadian Mining Institute. Souvenir Number. Summer Excursion. Edited by the Secretary.

Well nigh 300 pages of narrative, not to mention another hundred pages of miscellaneous matter, including a bibliography of Geological Survey publications relating to the mining districts visited during last summer's excursion, this is the material that goes to make up the latest bulletin of the Institute.

The story of the journey through Canada from coast to coast is attractively told. The Secretary displays a sense of proportion and not a little literary discrimination. At no point does one become weary in reading of the doings of that noble band of excursionists.

At judicious intervals the reader's interest is sharpened by humorous incidents. It is worthy of remark that, staid and respectable as are the members of the Canadian Mining Institute and their guests, there is a noticeable brightening of the atmosphere during the western itinerary. The misogynist might attribute this to the absence of ladies on this part of the journey; but we have no wish to do more than state the fact.

The tragedy that was enacted at Calgary is touched upon deftly. There is, however, a notable hiatus in the Secretary's official account of this soul-stirring event. He omits mention of his own tactical response to the steer's hostile demonstration. This oversight is partly redeemed by a carefully compiled table of casualties.

One of the happiest occasions that marked the peregrinations of the pilgrims was the dinner organized by the effervescent Treasurer on the last night of the journey. If for no other reason, this dinner will be remembered for all time as having brought from Mr. Obalski a weighty pronouncement on the melon industry of Quebec; and a similarly important utterance from Mr. Davies-Evans on the possibilities of gem propagation in Ontario.

Of what happened at Nelson, at Granby, at Glace Bay, we shall leave the reader to learn for himself.

Mr. Lamb has done his work well.

EXCHANGES.

Mining and Scientific Press, Jan. 16, 1909. A discussion held by the Pacific Coast division of the Mining & Metallurgical Society on Nov. 21st, 1908, is reported in this number of our contemporary. The subject of debate was the protection of investors. Many good points were brought out. For instance, one speaker told of the objections that certain directors had to publishing the working costs. It was feared that if the miners knew how cheaply the ore was mined they would assume that the company could pay them more wages.

Another speaker claimed that since a mining engineer is obliged to render to his directors an estimate of ore reserves and cost-sheets, so, in turn, should the directors render to all stockholders a similar report.

The Mining World, Jan. 23rd, 1909. An editorial on the "Prospector and the Blowpipe," in this issue of our contemporary, is well worthy of quotation. "In some things," says the Mining World, "a little knowledge may be dangerous, but in others it may mean a fortune. The prospector need not have a scientific or technical education to be fairly successful, but he will find it to his advantage to have a working knowledge at least of chemical analysis by means of the blowpipe as by its aid he will often be able, after a few minutes' work, to determine whether or not a mineral contains anything of especial value. . . . The procedure is simple and easily acquired after a little study and practice. . . . Blowpipe tests do not replace the chemical analysis or assay, but is rather preliminary to it."

PERSONAL AND GENERAL.

Mr. J. B. Woodworth has returned from a trip to Miller Lake.

Mr. Herbert Salinger, who represents Beer, Sondheimer & Co., was in Toronto on Jan. 22nd.

Mr. Guernsey is spending some weeks in Cobalt in the interests of the Consolidated Mining & Smelting Company.

Mr. George E. Leighton, representative of the Hardy Patent Pick Company, was in Toronto on Jan. 22nd and 23rd. Mr. Leighton has just completed a tour through the coal mines of Nova Scotia and the mines of Cobalt.

The death is announced of Alexander Macdonald (Big Aleck), who became famous some years ago on account of his acquisition of wealth in the Klondike. Mr. Macdonald was a native of Antigonish County, Nova Scotia. A short time ago he lost his entire fortune, but by dint of hard and plucky work he had become a wealthy man.

INDUSTRIAL PAGE.

DALLETT COMPRESSORS.

A complete line of air compressors as built by the Thos. N. Dallett Co., of Philadelphia, Pa., bring out many excellent and unique ideas in compressor design.

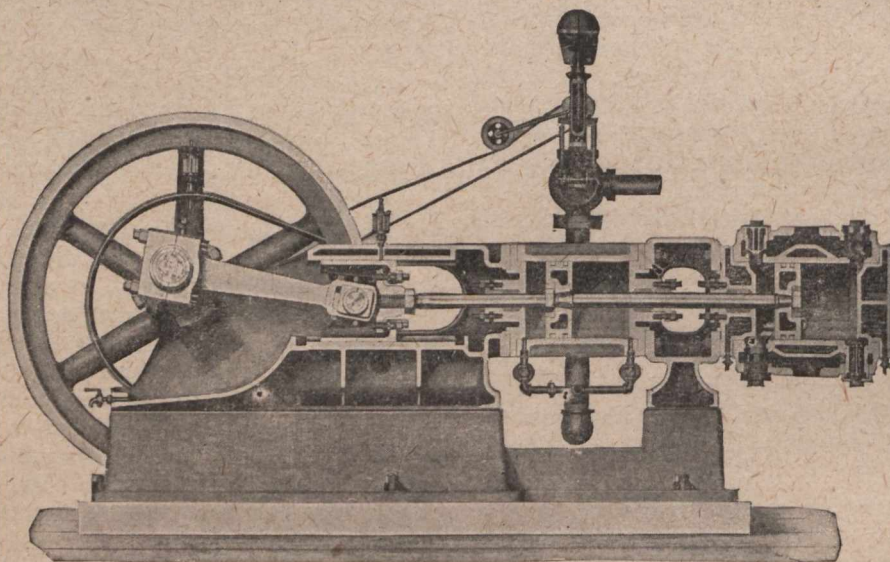
These compressors incorporate the essential features of having all parts requiring adjustment or renewals, readily accessible, utilizing only the best material and workmanship throughout. A liberal amount of metal, scientifically placed, is used to insure rigidity in operation.

The frame is of the open-work centre-crank type, graceful and pleasing in outline, and of an especially massive and rigid design to obtain on each size compressor a greater range of capacity by substituting, when desired, a cylinder of the next larger size than the standard to operate at 100-lb. pressure. For example, on an 8-inch stroke compressor the regular cylinder for 100-lb. pressure is 8 inches in diameter; but a 10-inch diameter cylinder can be substituted and still operate at the above pressure, whereby a greater volume of air

a rough temporary foundation of timbers, or a permanent one of concrete or brick. An oil gutter is provided entirely around the lower base flange on all sub-bases. This is an excellent feature, as it insures a clean foundation and floor free from unsightly oil puddles and stains.

The steam cylinder and valve gear of the steam driven machines are examples of up-to-date steam engine practice, and are suited to the operation of compressors, giving high efficiency with slight attention. All steam ports are short and direct and of the proper area. The clearance has been reduced to a minimum, giving appreciable saving in steam consumption. A plain D balanced slide valve is used on the small and medium sized machines; the Meyer balanced adjustable cut-off valve being employed on the larger machines. To provide efficient heat insulation, all steam cylinders are lagged with a mineral wool and neatly jacketed with planished sheet steel.

The rocker arms on all valve gears are provided



Sectional Elevation of Single Steam Machine.

is obtained with but a slight increase in cost of machine.

The cross head guides are cylindrical and are bored at the same setting as the boring and facing of the end which receives the cylinder. This insures absolute alignment, as the end is flanged for bolting the cylinder to the frame. The convenience in tightening the cylinder stud nuts, which are on the outside, will be appreciated by the user.

The main bearings are lined with a high-grade babbit metal, which is poured into dovetailed recesses and is thoroughly pinned in to obviate shrinkage, and then bored and scraped to fit the crank shaft.

Lubrication is effected by means of high-grade sight feed devices, or by gravity or force feed system, as desired, and drains are provided for draining off all drippings from guides, stuffing boxes, and crank pit.

The duplex belt, duplex steam and single steam machines are supported on an exceptionally rigid and deep sub-base, thus making the entire machine self-contained and obviating any possibility of getting out of line, and insuring satisfactory operation on either

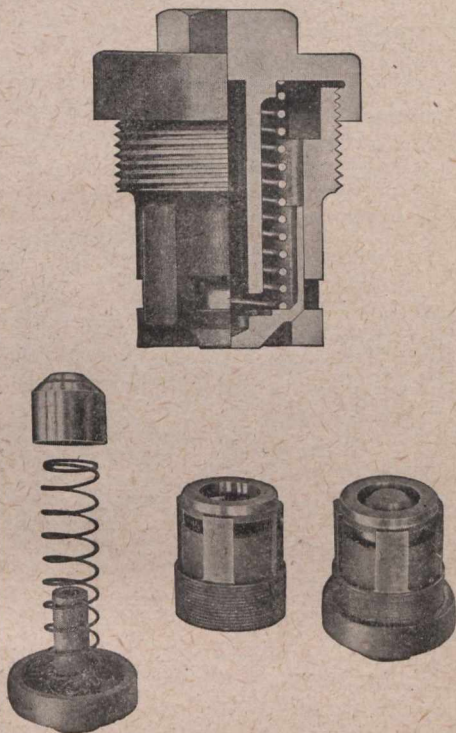
with means for adjustment, doing away with all lost motion.

On every steam-driven machine the governor is equipped with a safety stop device, which immediately stops the machine in case the governor belt should break.

In the case of duplex compressors with compound steam cylinders, a difficulty has been that if the machine stops with the high pressure side on dead centre, which occurs frequently, it will not start automatically, this being due to the fact that but one side (the high pressure) takes steam from the line. This trouble has been overcome by using a reducing valve of standard make, which reduces the live steam pressure for use in the low-pressure cylinder. Thus if the high-pressure side stops on the dead centre, live steam is fed to the low-pressure cylinder through the reducing valve, starting the compressor. It is obvious that steam from the boiler is taken into the low-pressure side only when starting, otherwise the operation is identical with any compound machine.

The air and steam cylinders are tied together and

held in position by means of an internally flanged tie or distance piece. On the smaller sizes this piece supports the air cylinder, but on the larger sizes the air cylinder is supported on a pedestal, while the tie piece is of circular design without foot piece. Ample openings are provided on each side of the tie piece to allow



Air Discharge Valves.

adjustment of the stuffing boxes and tightening the cylinder stud bolts.

The air cylinders are of a special hard, close-grained iron and allowance is made for reboring if necessary. Suitable means are provided to obviate any chance of the air valves being drawn into the cylinder in case of breakage. Each cylinder is thoroughly tested before assembling under hydraulic pressure of 200 pounds, and all defective castings are eliminated. The clearance space is reduced to a minimum, and all heads and cylinder walls are thoroughly water jacketed, thus obtaining the highest efficiency possible. Means are provided for draining the cylinder and cylinder head jackets of water, this being essential in cold weather. The lubricant is fed directly into the intake passage, allowing the suction to carry the oil into the cylinder in the form of a fine spray. This mode of lubrication has been thoroughly tried out and found to give efficient and equal lubrication of all working parts.

Mechanically operated inlet valves are supplied on any size compressor if desired. Any of the "Dallett" standard low-pressure compressors are suitable for vacuum service, and are furnished with mechanically-operated inlet valves for a high vacuum.

The piston rod on both belt and steam machines is designed to allow for returning in case of wear. In returning a rod, allowance has been made in size to leave the threads untouched, only necessitating the turning of the straight diameter of the rod.

The cross head is a new type box pattern, made of semi-steel. Its shoes are adjustable and of large bearing surface. The upper shoe is lubricated by means of a sight feed lubricator, and the lower shoe runs continually in a bath of oil. One of the features of this

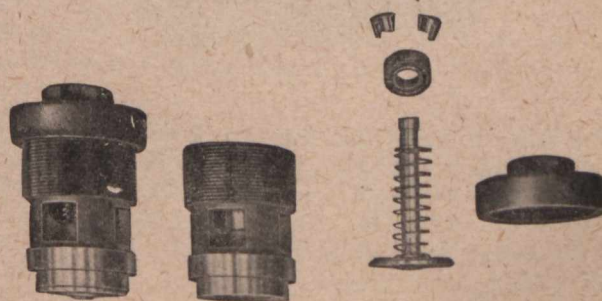
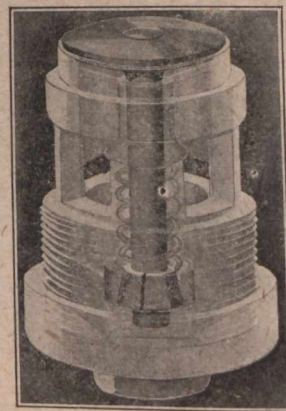
design is the side openings, which allow easy access to the cross head shoe binder bolts. The cross head pin is tool steel, hardened and ground. It is fitted to tapered seats in the cross head, drawn tight on the tapers by means of a nut held in position by a pin. Means are provided for turning one-quarter revolution in case it wears flat on the two bearing sides, thus doubling the wearing capacity.

The intake valve is of the automatic poppet type, contained in a malleable iron cage. The cage is one piece and combines both seat for the valve and guide for the valve stem. The cage is threaded and screws into the wall of the air intake chamber only and is simply seated in a recess on the main cylinder wall, using thin corrugated copper gaskets to secure a tight point. A hexagonal recess has been cast in all cages to accommodate a special cast steel wrench for use in removing and replacing valve cages.

The valve cage cap acts as a lock nut for holding the cage in place after it has been screwed down on its seat in the cylinder. In the case of a compound machine, corrugated copper gaskets are placed under the valve cage caps on the high-pressure cylinder to insure against any leakage, as the discharge pressure from the low-pressure cylinder is constantly at these joints.

The valve proper is a special alloy hardened steel, with seat and stem ground to gauge. The valve spring is of phosphor bronze and of the right proportion to give the valve an easy opening and a quick closure.

Much annoyance and trouble has been caused on certain makes of intake valves due to the spring holders shearing off or working loose. The cause of this trouble is the sudden stopping of the valve on its seat, which tends to drive the spring holder off the valve



Air Inlet Valve.

stem. This effect may be likened to driving a hammer on its handle by means of hitting the handle on its opposite end. The principle involved is identical.

To eliminate this defect and the trouble caused by threading and pinning the spring holder to the valve stem, solid ends have been employed by some builders,

which necessitates a split guide and complicates the valve parts.

On the "Dallett" valve the spring holder comprises a split taper ring set in a recess on the valve stem, and held together and tight to the stem by means of a solid taper ring slipping down over it. The hammering of the valve on its seat tends to tighten the spring holder on the stem instead of driving it off, due to the action of the taper.

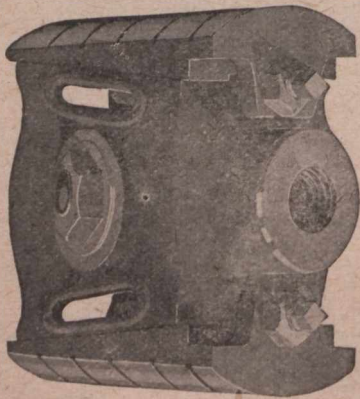
The discharge valve is of the automatic poppet type contained in a valve cage of malleable iron. The method of seating in the cylinder and locking to its seat is identical with that of the intake valve. A projection or boss has been provided on the valve cap which acts as a positive stop for the valve when it has reached a lift giving full opening area, and does away with fluttering. This same projection on the cap also acts as a spring guide for the valve spring.

The discharge valve, light and of ample area, is of the same material as the inlet, having all wearing surfaces ground to gauge.

Both inlet and discharge valves are simple and compact, and each valve requires not over a minute's time for removal complete.

The connecting rod is of the marine type and is to be depended upon for the most severe duty. It is made of the best crucible steel, and both crank pin and cross head boxes are made of the highest quality phosphor bronze bearing metal. Adjustment is obtained at the cross head end by means of a wedge and split box. The crank pin end is adjusted by means of removable tin liners, and both bearing surfaces are of extremely liberal proportion, lubricated by wick wipers.

The crank shaft on both single and duplex machines is exceptionally massive, forged out of a solid billet of mild open-hearth steel, carefully turned and polished. In the case of a duplex shaft, the portion in the centre is enlarged to accommodate the heavy fly wheel.



Cross Head.

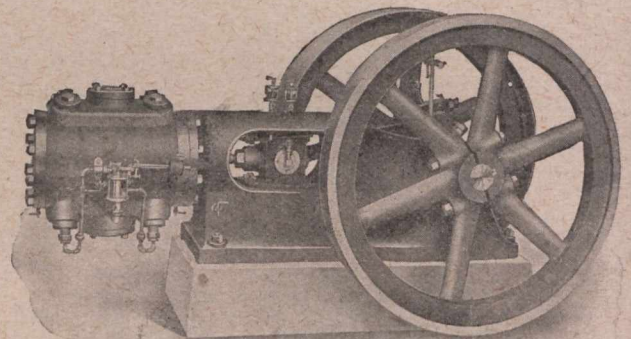
The wheels on all machines are heavy and of large diameter, insuring smooth operation and in the case of belt machines, the face is very wide. The fly wheels on the larger machines have square-cored holes in the rim to facilitate turning over by hand.

The inter-cooler plays a very important part in economical operation of a two-stage machine. The "Dallett" inter-cooler is of large cooling area, employing the return flow type of water circulation, using baffle plates to deflect the flow of air and aid in its effectual contact with the cooling tubes. This method is efficient in reducing the temperature of air between stages to approximately the original temperature, thus tending to reduce the final or discharge temperature

and also the horsepower required for a given capacity. The nest of cooling tubes may be removed intact from the inter-cooler box without disturbing any of the piping, as unions are supplied to obviate this feature. The inter-cooler is supplied with pop safety valve, pressure gauge and drain valve.

In a compressed air plant the demand for air is often of such an intermittent character that automatic regulation of the supply of air in accordance with the demand becomes a necessity.

The belt-driven machines are provided with an unloading device which automatically unloads the air cylinder. When a certain determined pressure is reached in the air receiver, one or more inlet valves at both ends



Single Belt Driven Compressor.

of the air cylinder are held open and the load is taken off the compressor, allowing it to run light until the pressure drops in the receiver, upon which the valves are released and air compression is resumed.

On the steam machines, a combined speed and pressure governor is used. This governor unloads the air cylinder exactly the same as on a belt-driven machine, and at the same time it controls the speed, allowing a single steam machine to just turn over, when unloaded, and bringing a duplex or compound machine to a dead stop. By this means a great saving in steam is effected and the wear and tear on the working parts is reduced.

A complete unloading equipment is furnished with each machine.

The compressors described are built in sizes from 8-inch stroke up to and including 16-inch stroke, and give a range of capacity from 79 cu. ft. of free air per minute to 1,200 cu. ft.

Special machines for any capacity, pressure or service, or any standard machine direct connected to motor, water wheel, or gas engine, can be furnished in addition to the standard line.

Sullivan rock drills, air compressors and hammer drills are now carried in stock at Spokane, Washington, by the United Iron Works, who have succeeded the Bradley Engineering & Machinery Company, as agents for the Sullivan Machinery Company. The United Iron Works also represents the Sullivan Machinery Company at Seattle, and will carry a stock of drills, compressors and supplies at that point, 109 Main St. Mr. Austin Y. Hoy, is the personal representative of the Sullivan Company in this territory with headquarters at Spokane.

SPECIAL CORRESPONDENCE

NOVA SCOTIA.

Glace Bay.—U. M. W. of America and the Coal Companies.—After organizing a "local" of the United Mine Workers of America in Springhill, the paid organizer of this organization has visited Cape Breton, and during the past few weeks there has been great activity in the miners' lodges. One or two of the P. W. A. lodges have gone over bodily to the newcomer. Other lodges are stated by the U. M. W. of America leaders to be dissolved, while the P. W. A. supporters say they are not dissolved, but are still in vigorous existence. One of the most important of the lodges, that at Caledonia Colliery, was declared by supporters of the American body to be dissolved, the charter was ordered to be returned to the Grand Officers of the P. W. A., and steps were taken to realize on the property owned by the lodge. The minority of P. W. A. supporters reorganized themselves, and through the Grand Council of the P. W. A. have applied for an injunction restraining the U. M. W. of America from dividing the property of the lodge among the members. The injunction was granted, and will in all probability be continued until the action of the U. M. W. of America against the P. W. A. is tried, which will, it is expected, take place at Sydney in April. On the result of the main action the continuance or otherwise of the several injunctions and cross-injunctions granted by the courts will of course depend.

Some incertitude has existed as to the attitude which would be adopted by the operators towards the new order, but the coal companies have now declared themselves, and state that they will not recognize the U. M. W. of America as representing their workmen. The Glace Bay Gazette published an interview with the general manager of the Dominion Coal Company on the 20th of January, in which the Coal Company have made public their attitude towards the present agitation, and their views on the general situation thereby brought about. Briefly, the statement of the Coal Company is that they will not recognize the U. M. W. of America; that to do so was impossible because the company had an agreement with the P. W. A. as representing all their workmen, and must keep faith with that organization, as it had been their experience that the P. W. A. was loyal to its undertakings. In the course of this interview the general manager of the Coal Company made the following serious statement: "I am of the opinion that the whole campaign is a direct attack on the Canadian coal trade, which has always been regarded with jealous eyes by the United States operators, and it is the duty of every patriotic Canadian to use his best endeavor to preserve to the people of Canada that which justly belongs to them."

The Nova Scotia Steel and Coal Company have taken the same stand, and it is understood the mainland operators have adopted the same attitude.

The startling increase in the imports of United States coal into the Montreal market, the recrudescence of the agitation against the import coal duty, the persistent competition that is being met with from United States sources, taken together with the present activities of the U. M. W. of America at a time when the large railway contracts are being negotiated, is a concatenation of circumstances that bode ill for the Nova Scotian coal industry.

Eight Hour Day Commission.—The commission appointed by the Local Government has commenced its tour, and it is expected evidence will be taken at Glace Bay about the 25th of January.

ONTARIO.

Cobalt.—There has been published not a little criticism of official statements made concerning several of the leading Cobalt mines. The Canadian Mining Journal spoke disapprovingly of the manner in which La Rose flotation was put upon

the market. Since that time La Rose affairs have been conducted with sobriety and with a businesslike air. I don't mean to attribute this to anything said by the Journal. It is due rather to the fact that La Rose executive wakened to the fact that publicity is a darned good thing when properly used. All of the larger mines are wakening to this idea. Nipissing gives out full statements. Trethewey partly follows suit. Coniagas, a private corporation, does likewise.

All of us will be glad to see other mines follow the example of those mentioned above.

Lately, Crown Reserve has been getting whacked. Mr. Alex. Gray, who has a keen scent and a prolific pen, took kindly exception to Manager Cohen's assertions as to mining costs. A stockholder of Crown Reserve replying to Mr. Gray, states that Mr. Gray's figures are excessive, and that he has overlooked several factors in making his calculations. I do not care to take sides in this controversy. To me the point seems this: It is remarkable that silver can be mined at a cost of between 8¼ cents (Mr. Gray's figure) and 7½ cents (Mr. Cohen's figure). This fact speaks volumes for the mine and for Cobalt generally. So far as the dispute is concerned, both Mr. Gray and Mr. Cohen are perfectly able to take care of themselves.

Speaking of publicity, is it not time that we knew something about the Provincial mine? If it is a success, we should know. If it is a failure, we have a greater claim to know. The Province is spending money there. The money is yours and mine and the other fellow's. There is no disgrace in any event.

Gowganda is on everybody's mind—everybody, that is, who is not making money in Cobalt. Development up to date has shown several exceedingly rich surface showings. Crowds are rushing in. Many are about as much prepared to face the weather as a three-shell man is to preach the gospel. Snowshoe staking is the order of the day. There will be awful slaughter when the inspectors get down to business next spring.

The Elk Lake district is about a year and a half old. The work that has been done there gives one a fair measure of what may be expected at Gowganda one year hence. Of course, there will be better transportation and all that sort of thing. Nevertheless, the whole country will stand a lot of development. At present a few men with claims to sell are doing a whole lot of damage to the district by shouting too much. The whole truth, apart from excitement, is that the country all around Gowganda gives rich surface indications. This is qualified by the general truth that all the veins discovered are not at all extensive. No one but a fool would attempt to prophesy about the depth, and so on. But there is lots of room for good honest work. This cannot begin until next spring. So when you hear marvellous stories of Gowganda don't be tempted to have a look in until the fakirs have finished their winter campaign. It doesn't pay to get excited.

Now, this does not mean "knocking." The country doesn't require either "knocking" or "boosting." What it needs is the truth as nearly as human beings can come to the truth. Since only a little truth is visible under four feet of snow, we'll have to wait until the April sun has done its business.

Mr. Fraleek, of Cobalt Lake Mining Company, is in Toronto.

Capt. J. E. Leekie is also in the metropolis.

There are a good many well-qualified young fellows, college graduates and others, looking around for prospecting work. A good way for an investor to get his money's worth is to send out a reliable man to prospect for him. Then he'll have the satisfaction of getting one or more good claims—or nothing. And there may be many more Gowgandas.

BRITISH COLUMBIA.

Phoenix.—The new year is starting off with steady and heavy shipments from the various mines now working and things look good for the coming twelve months.

Development in the Phoenix Amalgamated group of the Consolidated Co. is showing up a richer body of ore than it was at first expected the strike of some weeks ago would run. The blocking out of shipping ore on the property continues and arrangements are being made to build a tramway and spur in order that the shipping of ore will be facilitated when the company is ready to ship.

There is nothing new in Dominion Copper affairs. Authorities seem inclined to advise stockholders in that company to keep their stock rather than sell at the very low prices now offered by brokers. Mr. P. F. Roosa, liquidator, has returned from New York but has nothing definite to say. It is said that the engineers who went over the property of the Dominion Copper Co. state that it is not worth more than \$400,000, about one-half of the amount of the outstanding bonds, which amount to \$800,000, then there is about \$100,000 of floating debt and 500,000 shares of stock of a par value of \$5 to be looked after. It makes the situation look dark. But the property has a prospective value under working conditions that may be taken into consideration; what this prospective value is would be hard to say. If the men in charge of the reorganization are inclined to be fair to the stockholders it would seem advisable to have them participate in that reorganization, either by an assessment of some advantage over the general public in the way of securing stock in the new concern, turning in their stock in the Dominion Copper Co.

M. K. Rogers is again to be more intimately connected with the Daly Reduction Co., Hedley, than he has been since he resigned active charge of the work.

The tunnel on the Kingston, Hedley, after leaving the dyke entered a good body of ore. Drifting is now in progress along the contact.

Considerable interest is being taken in the coal measures known to exist in the Similkameen and Nicola districts, and much active work is being done on the properties. It is stated that American capitalists are thinking of building a smelter at or near Oreville, Wash. Should such a plant be erected at this point coke from the Similkameen or Nicola mines would be more likely to find a market there than that from any other district, as a neat sum could be saved in freight rates.

The tunnel on the Bell, Wallace mountain has cut a six-inch vein of rich silver-gold ore. Work is being extended on this adit to tap the main ledge.

Anent the copper combine that is being formed in the Eastern United States, it is stated that neither the Granby nor any of the other British Columbia copper producers are directly interested.

Things are forming themselves for a dividend from the British Columbia Copper Co. This concern, since they resumed work in June, 1908, (to the end of November) made a net earning of \$232,609 from their mining and smelting operations. About 5,547,874 lb. copper was made during the six months. When work was resumed early in the year there was an outstanding debt of \$170,000, which has been paid off and there was a sum in the neighborhood of \$25,000 on hand Nov. 30th. It had been suggested that a surplus of \$100,000 be acquired before dividends were paid; even if this policy is carried out a dividend will be forthcoming early in the present year, 1909.

The tunnel on the Woodburn is now in over 350 feet. It is expected the ledge being driven for will be entered before another fifty feet has been driven.

Rossland.—The Rossland mines continue to make a steady output. The Le Roi is attracting more than usual attention by the good results being obtained in the operations of mine and smelter. The mine manager's report for November, for example, shows that 6,150 tons of ore were shipped that carried 4,178 ozs. gold, 1,900 ozs. silver and 91,000 lbs. copper. In development work \$12,000 was spent. This output in the gross is valued at \$100,000 and after operating expenses are deducted will show a substantial profit.

The Le Roi 2, Ltd., in November, shipped 2,420 tons, from which the smelter receipts were \$28,795.50.

Some good results have been secured from shipments of select ore from the Blue Bird, Nest Egg and Evening Star mines and considerable work on the smaller properties is likely to be done during the coming year.

Nelson.—The zinc smelter is a success! This is the verdict after exhaustive tests, and, finally, the treatment of commercial shipments of zinc ore. The plant of the Canada Zinc Co. has been five years in arriving at its present stage and represents an outlay of nearly \$125,000, of which the Provincial Government advanced \$20,000. The smelter is 10 tons per day capacity at present, but now that it has passed the experimental stage the capacity will be increased to 30 tons per day. The ore so far treated has averaged 40 per cent. zinc, 10 per cent. lead, 12 oz. silver, and 1-5 per cent. copper per ton. The copper is saved in the form of matte. A vertical furnace, heated internally by electricity is used at this smelter. The electrical heating does not destroy the metallic gas, which is the result of heating zinc to a certain point, and any lead in the charge falls to the bottom of the furnace and can be collected separately from the spelter. It can be readily seen what the advantages of this arrangement are over that of treating ore in horizontal retorts as practiced in the zinc smelters. Much labor is done away with and there no expense for breakage or first supply of retorts, etc. The smelters in this district, and elsewhere, penalize zinc ores, as the blast consumes the metallic gas into which the zinc changes, leaving an infusible zinc oxide residue, which eventually leads to the clogging of the furnaces. The condition at the Sullivan mines is a good example of this: Zinc in this district is associated with the lead ore from the surface, where it runs in well defined veins, and can be handled with little trouble, but at depth the zinc blends with the other ore and increases in quantity. In the Sullivan mines this condition reached such an acute stage that the smelter was closed down, the furnaces not being able to handle the ore profitably, as it contained such a quantity of zinc.

The solution of the problem of smelting zinc ore or lead ores containing a percentage of zinc is very welcome to the lead-silver miners of this district, as it will mean in the future a greater production of mines that have hitherto been greatly handicapped and money kept in the country, that was formerly paid foreign smelters for the treatment of zinc.

Kaslo is quite a lead-zinc centre and since the announcement of the success of the Nelson zinc smelter quite a change has taken place for the better. It is stated there are several deals of importance on for promising mines in that section.

The Lucky Jim, at one time a silver-lead shipper, but which afterward developed into a silver-zinc mine, has been bonded to men connected with the Standard Oil Co. It was examined last week by E. W. Jessen and W. A. Bradley, of Spokane, for the Eastern capitalists.

Vancouver.—It is said that T. J. Smith raised nearly \$200,000 during 1908 and placed the affairs of the Diamond Vale Coal Co. on a sound basis. The mine is shipping about 100 tons per day.

A diamond drilling outfit is being placed to work on the claims of the Swayne Copper Co., Lynn Creek, across the inlet from this city. The president of the company, Dr. Sawyne, says the ore is self-fluxing, carries an average of 6½ per cent. copper and some gold.

GENERAL MINING NEWS.

NOVA SCOTIA.

Glace Bay.—The Dominion Coal Company has sufficient orders to keep every one of the mines going at half time for the next two months. It is hoped this year's output will reach the four million mark. There are over 6,000 miners on the payroll.

Port Hood.—Despite the unfavorable conditions during 1908, the Port Hood-Richmond Railway & Coal Company has given steady employment so far to miners and surface men. All coal has been marketed at paying prices, and prospects for the coming year are very bright.

Reserve.—No. 10 section in the east slope is to be reopened. The opening of this section will give employment to about 20 pair of hand cutters, and will relieve to a certain extent the overcrowding in other parts of the mine. No. 10 has started sinking for a new lift to be ready May 1st.

The erection of the new trestle for banking the Emery slack coal is proceeding very slowly on account of weather conditions, and it will be some days before coal can be banked.

ONTARIO.

Amherstburg.—A large deposit of silica has been discovered near here. Analysis shows that it is nearly 96 per cent. pure, and with no trace of oil. The discovery will probably lead to the establishment of a glass factory in this county.

Gowganda.—The Canadian Northern Ontario has been accepting freight for Gowganda via Bellwood since January 20th. Passenger service on the sleigh road is expected to start Feb. 1st.

The T. & N. O. is considering the building of a branch line from Elk Lake to Gowganda.

Mining Recorder Torrance is accepting applications for filing subject to prior right, it being impossible to keep maps up to date from day to day. So great is the rush that a fourth assistant has recently been added to the staff.

Much litigation is expected over the withdrawal by the Government of the lakes, nearly every one of which has been applied for.

Cobalt.—Reports from Gowganda and Elk Lake say that there is danger of an outbreak of typhoid owing to prevailing conditions.

Many men are going into the country totally unprovided for the extreme cold, and much suffering is expected.

The shaft of the Otisse-Currie is down 47 feet by 11 feet. The vein, which was three inches wide at the surface, has broadened to 13 inches at the present level. The boilerhouse is completed, and the hoist, pump, and boiler installed.

Cobalt.—The framework of the O'Brien concentrator is complete. By the early months of spring it will be turning out concentrates. This will mean a particularly large saving in freight.

The Muggley concentrator has shipped 36 tons of concentrates to Perth Amboy, New Jersey.

A 60-minute motor car service is projected between Temagami and New Liskeard by the T. & N. O. Railway Commission.

BRITISH COLUMBIA.

Nelson.—A gold ingot weighing 304 ounces and valued at about \$5,000 was produced at the Nugget Mine on Sheep Creek. This is the fourth ingot made since the stamps were installed last November, making a total value of \$20,000 obtained from second-grade ore in two months.

Ingenika.—It is reported that bedrock is struck at a distance of 30 feet on the Ingenika R., and at 90 feet on McConnell Creek. The value at bedrock has not so far been ascertained, as the miners are troubled with over-supply of water.

Grand Forks.—E. Jacobs, Secretary of the Western Branch of the C. M. I., has sent out notices stating that the meeting called for January 14th at Greenwood has been postponed until January 25th. Trouble at the mines and smelters caused by shortage of power and general freezing up made it impossible for many members to attend on the original date.

Kaslo.—Negotiations are under way for the purchase of the True Blue Mine. The force is to be increased, and it is expected that the mine will soon become a regular shipper.

Kaslo.—Ore shipments through Kaslo in December were the lowest for several months, being only 881 tons, including silver-lead and zinc. The total shipments for the year amount to 13,691 tons, of which 6,318 tons were silver-lead and 7,373 tons zinc ores. Practically all the zinc tonnage came from the White water Deep Mine.

Phoenix.—About 240 men are working regularly at the Mother Lode Mine. In winter all the ore is mined from the interior stopes, and it requires a larger force to keep up the requirements of the smelters.

Practically all mining in the Boundary and West Kootenay was suspended for four days through lack of electrical power, anchor ice interfering with the plants.

Greenwood.—The fourth general meeting of the Canadian Mining Institute is to be held here on January 25th. The only nomination for chairman is that of Mr. T. Kiddie, manager of the Northport Smelter. Twelve members of Council of the branch will be elected by ballot. The members of the General Council will be members ex-officio of the Branch Council. The members are to be distributed territorially.

Vancouver, Jan. 13.—Vancouver men have acquired coal lands on Slate Chuck Creek, Queen Charlotte Islands, on which operations will start May 1st.

The formation is of sandstone, shale, and schist, and the coal a good anthracite. If the diamond drill proves coal at depth, it is proposed to erect a suitable plant. In order to handle both anthracite and bituminous coal, coke ovens and tram lines to deep water will be built.

Should the Queen Charlotte coal prove good, a line of steamers will be established between Queen Charlotte and Mexico, where the same people are reported to be establishing a large steel plant at a cost of ten million dollars. If the iron ores at Cumshwa Inlet are as represented, the same parties will doubtless establish steel works on Queen Charlotte Island.

Windy Arm.—The concentrator at the Venus Mine is now handling 100 tons per day, and preparations are being made to double this capacity.

The Montana Mine is now being developed by the Yukon District Gold Mining Co., which controls most of the mines now being worked.

The outlook has improved lately, on account of some excellent new discoveries. On the East Rand the Brokpan Mines has encountered some extremely rich ore. The New Modderfontein's extensive property has opened up satisfactorily, and the reduction and treatment plants have to be enlarged to deal with the increased output. On the Central Reef the City Deep Co. has exposed a quantity of ore assaying nearly £2 per ton. In the Main Reef West high values over a considerable area have been exposed.

MINING NEWS OF THE WORLD:

GREAT BRITAIN.

The Board of Trade returns show total exports of coal during 1908 amounting to 65,180,646 tons, valued at £41,615,923, as compared with 66,063,258 tons, valued at £42,118,994 in 1907. In addition, 19,474,174 tons were shipped for the use of steamers engaged in the foreign trade, as against 18,618,828 tons in 1907. The principal increases were in shipments to the North of Europe, while exports to Germany, Holland and Egypt showed a considerable decrease.

An estimate of the profits of South Wales collieries, based on the operations of twelve leading companies gives the gross profits per ton of output for 1907 as 2s. 5d. For the present year, taking into account the effects of the Eight Hour Act, the estimate of probable profit is 1s. per ton.

RUSSIA.

There has been a considerable decrease in the gold industry on the Lena and the neighboring gold fields. But at Vitim and Olekma the situation is improving and the output increasing. At the mines of the old companies twice as much gold has been washed as formerly, and modern methods are being largely introduced.

HUNGARY.

Fifty-six miners lost their lives by an explosion in the Auka coal mine at Veszprim, about 60 miles from Budapest, on the 14th of January.

AUSTRALASIA.

A French syndicate, which has been operating for three years on an alluvial field known as McCaulay's Lead, 20 miles from Chatsworble, New South Wales, will put in modern gold-saving machinery, costing several thousand pounds, having been able to secure good results by primitive methods.

The Broken Hill Proprietary mine, New South Wales, has closed down, owing to the refusal of the men to accept a reduction of wages. Four thousand men are directly concerned, and a larger number indirectly affected. The question of wages will be referred to the Federal Arbitration Court.

The ore reserves of the North Lyell copper mine, Tasmania, have been increased by 169,121 tons during the six months ending September 30th. There is now available for stoping at the North Lyell 710,333 tons.

The discovery of a new tin-field in the Gunyale district, Victoria, is reported. Tin has been found on the surface, and an area of some 2,000 acres has been staked.

SOUTH AFRICA.

Greater progress was made in the gold mining industry of the Rand during 1908 than in any previous year. The great

feature has been the general reduction in working expenses, owing to the installation of tube mills and larger batteries with heavier stamps and greater attention in the matter of securing efficiency in labor. Some of the larger mines fitted with up-to-date machinery capable of handling ore in large quantities are profitably crushing ore of as low value as 4½ dwts. to the ton. The chief mechanical appliance which has contributed to these improved conditions is the tube mill, of which some 115 were operating at last accounts, as compared with 72 at the beginning of last year. During November the average working costs of the mines on the Rand amounted to 17s. 6d. per ton, a reduction of 1d. per ton as compared with October.

The coal export trade via Delagoa Bay is assuming respectable dimensions. A shipment of 2,000 tons was recently made to Madras, India, being the first to that destination.

UNITED STATES.

The Colorado Legislature is considering a bill providing for the creation of a state commission to control the smelting industry, along lines similar to those of the railroad commission. The measure also provides for a state assayer and for the erection of a refining and smelting plant at the State School of Mines at Golden, where smelting in all its branches may be taught.

The Heroult electrical smelting plant in Shasta County, California, operated by the Noble Electric Steel Co., is going ahead with installation, and the power is ready to be turned on when the smelters are finished.

About 150 miners were killed by two successive explosions on December 28th and January 12th at the Lick Branch colliery, near Bluefield, West Virginia. A disastrous gas explosion also took place at Joseph Leiter's colliery at Zeigler, Ill., on January 9th, resulting in the loss of 25 lives.

Diamond mining is being successfully prosecuted in Pike County, Arkansas. The total number of stones so far found is 540, of which 505 weighed 217 carats. The largest so far discovered weighs 6½ carats. Many of them are of good water and remarkable purity.

A merger of gold-dredging companies having interests near Folsom and at Oroville, Cal., has been effected, the cost of purchasing the interests involved being \$7,000,000. The new company is capitalized at \$25,000,000.

MEXICO.

The Concheno Mines, in Chihuahua, purchased by the Greene Gold-Silver Co. from Corrigan, McKinney & Co., of Cleveland, O., for \$1,250,000, have reverted to the vendors on account of the inability of the purchasers to meet their payments.

Some of the Mexican mining corporations are planting eucalyptus trees on their properties to secure future supplies of mine-timber, anticipating that present sources may before long be exhausted.

COMPANY NOTES.

NIPISSING ISSUES FINANCIAL STATEMENT.

A brief financial statement of the operating company dated January 1, 1909 shows cash and ore to total \$972,643 against \$977,000 at the end of September. In detail this statement shows:—

Cash in bank and bullion on hand	\$495,652
Ore in transit and at smelters	380,828
Ore sacked ready for shipment	96,163
Total	\$972,643

The company is carrying less ore sacked and ready for shipment, the item falling below the \$100,000 mark, comparing with \$112,000 six months ago and \$200,000 nine months ago.

BROME COUNTY ASBESTOS CO.

The annual meeting of the shareholders of the Brome County Asbestos Co., Ltd., was held at the head office of the company in Eastman on the 19th inst., when the same Board of Directors were re-elected, and the following officials were appointed: F.

A. Olmstead, President; C. A. Nutting, Vice-President; A. C. Lyttle, Secretary-Treasurer.

The net earnings of the British Canadian Asbestos Company for the seven months of the fiscal year ending December 21st amounted in round numbers to \$110,000, so that after deducting bond interest for the entire year, viz., \$50,000, a surplus of approximately \$60,000 was left over, equal to 6 per cent. on the stock.

BRITISH COLUMBIA COPPER DIVIDENDS.

The directors of the British Columbia Copper Company intend to resume the payment of dividends early during the coming year. The company declared its initial quarterly dividend of 25 cents per share, and an extra disbursement of 15 cents a share, or a total of 40 cents a share, on July 18th, 1907. The directors are in favor of paying 2 per cent. bi-monthly or 12 per cent. a year. A dividend of 2 per cent. on the preferred shares of this company for the quarter ending December 31st, 1908, has been declared.

PONTIAC SILVER MINING CO.

A meeting of the directors of the Pontiac Silver Mining Company was held in Toronto on January 22nd. The following officers were elected: President, Clifford H. Moore, of Cobalt; Vice-President, W. E. F. Paine, of Toronto; Managing Director, Harold P. Davis, of Cobalt.

The capital of this company is \$1,000,000, divided into one million shares of \$1 each, with 300,000 shares in the treasury.

The directors of the company have authorized the sale of 100,000 shares of the treasury stock at 30 cents a share, and a large proportion of this issue has already been taken up by individuals interested in the company.

A small plant will be installed at once. The Flynn property, which consists of 22 2-10 acres, adjoins the Drummond Mine, and was purchased in November by Mr. Harold P. Davis. Since that time a force of men has been at work. Early in December the discovery was made of a rich vein of calcite and silver. After obtaining a satisfactory report from Mr. Frank C. Loring, the Pontiac Silver Mining Company was organized to take over this property.

A shaft has been sunk 25 feet on this vein, some distance from the original discovery, with favorable results.

The vein in the bottom of the shaft is from 10 to 20 inches wide, and carries silver values from the surface, ranging from 60 oz. upwards.

It is the intention of the management to sink this shaft to a depth of 100 feet, and drift on the vein at the 50-foot and 100 foot levels. There is every indication that the drift at the 50-foot level will develop a body of high-grade silver ore.

The Board of Directors of the Kerr Lake Mining Company on January 7th declared a quarterly dividend of 4 per cent. upon the capital stock of the company, payable March 15th, 1909, to all stockholders on record at close of business March 1st, 1909. Transfer books will be closed from 3 p.m., March 1st, 1909, to 10 a.m., March 6th, 1909. This is dividend No. 14.

The City of Cobalt Mining Co., Limited, has received permission to increase its capital stock from \$500,000 to \$1,500,000.

Dominion Coal has declared the usual half-yearly dividend of 3½ per cent. on the preferred stock, payable February 1st.

The Ontario Government has received a cheque for \$15,000, being royalty for the last three months of 1908 from the Crown Reserve Mine. The Government receives this on a 10 per cent. basis.

An extra monthly dividend of 1 per cent. has been declared by the directors of the Buffalo Cobalt Mines, Limited. The

dividend is payable on February 1st to shareholders of record January 20th. The books will be closed on January 20th and re-opened on February 2nd. This is the second monthly dividend declared by the Buffalo Mines, the first being paid on January 1st, together with a quarterly dividend of 5 per cent.

TRETHEWEY SILVER-COBALT MINE, LIMITED.

DIRECTORS' REPORT.

To be Submitted to the Annual Meeting of Shareholders to be Held at Toronto on Wednesday, the 27th day of January, 1909.

The Directors have pleasure in submitting the following Report, Statement of Revenue and Expenditure, and Balance Sheet, covering the period from 31st August, 1907, to 31st December, 1908:—

The total Revenue from all sources during the above-mentioned period amounted to.....\$357,970 78
The total Expenditure chargeable against the period was 147,446 47

Showing a surplus of Revenue over Expenditure of.....\$210,524 31
Out of which sum Dividends have been paid, amounting to 15 per cent. of Issued Capital..... 141,817 50

Leaving a balance of \$68,706 81
The balance at credit of Revenue Account on previous balance sheet was..... \$48,886 79
Against which are chargeable payments made in present period amounting to 4,485 35
44,401 44

The Balance at credit of Revenue Account at December 31st, 1908, being.....\$113,108 25
Additions to buildings and equipment installed during the period amount to \$15,661.46, bringing the total of these accounts to 50,808 71
Less Depreciation 5,351 58

Leaving a present estimated valuation of..... \$45,456 13

Repairs to buildings, equipment and plant, and all replacements, amounting to the sum of \$6,349.85, have been charged to operating expenses.

The liquid assets of the Company as at 31st December, 1908, consisting of cash in hand, due from Smelters, and ore in transit, amount to \$139,309.15. The ore in transit and due from smelters is estimated on the basis of the price of silver on the 31st December, 1908, namely, 50¼c per oz. Each one cent per oz. advance in the price of silver adds approximately \$2,500 to the liquid assets.

The total ascertained liabilities amount to \$11,522.31.

Production.

The production and receipts from the sale of ore have been as follows:—
Gross value of ore of all grades shipped.....\$398,638 47
Freight and treatment charges 42,958 14
Revenue from sale of ore\$355,680 33

Improvements.

Numerous improvements and additions to property and plant have been made, including a partial concentrating plant hereinafter referred to; machine drill sharpener; condenser; electric generator; triplex pump and motor, driven by a high-speed Robb-Armstrong engine, etc.

The heating plant has been rearranged to utilize waste heat from exhaust steam, and many other minor improvements have been made in various departments.

Development.

There are now three working shafts, situated near the southerly end of the property. No. 1 and No. 2—approximately 650 ft. apart—are connected by a drift on vein "F" at the first, or 50 ft. level. No. 2 and No. 3 shafts—110 ft. apart—are connected at the second level, which is 140 ft. below the collar of No. 2 shaft. No. 3 shaft has been sunk to a depth of over 200 ft., where a third level is being run east to the Nipissing boundary and west towards and under No. 2 shaft.

The total amount of shaft sinking, upraising, drifting and cross-cutting in these workings is over 4,500 ft.

Several thousand feet of surface work has been done, consisting of trenching, open cutting, and sinking prospecting shafts on veins and fissures occurring towards the northerly end of the property, but owing to the geological conditions there existing these operations failed to disclose any ore bodies of economic value. It has been demonstrated that the veins in that locality, with one exception, namely, the discovery vein on the Temiskaming & Hudson Bay location, do not carry values until considerable depth is reached, which confirms the experience already gained by this Company and referred to in the last Annual Report. By arrangement with the Temiskaming & Hudson Bay Company, a tunnel was run from the workings at their 100 ft. level towards and across the Trethewey north line, where the apex of a rich silver vein was encountered. This is now being developed from the 150 ft. level of the neighboring property, and from present indications should prove to be an important source of additional revenue to this Company. When sufficient development work has been done at the north end it is the intention of the management to sink a working shaft near the centre of the location. This will enable operations to be conducted from a central point and render it feasible to undertake systematic underground exploration of the property, which has as yet been developed within only a comparatively small portion of its area. There are numerous veins of no economic value showing at many places on the surface, some of which it is reasonable to assume may prove to occur under the same conditions as the north vein and be found to carry values at depth.

Diamond drilling operations were discontinued early in last year, after several veins had been located and important geological information gained, which has been turned to account in the conduct of mining operations.

Owing to the impossibility of accurately estimating the amount and value of ore placed technically in sight by development work on veins of the character existing in the camp, no attempt has been made to make such estimate, and the total cost of all exploratory and development work has been and will continue to be charged to operating expenses.

It is the intention of the Directors to continue an aggressive policy of development. Sinking will be resumed in the near future at No. 3 shaft, so as to carry on operations at greater depth on the various veins occurring in that locality. It is also intended to resume drifting from the lower level west from No. 1 shaft. This drift was abandoned in "Keewatin," where silver values had ceased to be found, although the vein remains strong and well-defined. Underlying the Keewatin a boss of diabase outcrops to the west, and the intention is to continue drifting through the Keewatin into the diabase in order to ascertain whether the silver values will re-occur when the vein enters the latter formation. In the event of this proving to be the case, sinking at No. 1 shaft may be resumed with confidence of reaching deeper ore deposits of value at that point.

Concentrating.

The system of treating ores adopted at the mine is at present confined to crushing and hand sorting, followed by partial concentration in a double compartment Hartz jig, the hutch product from which is treated on a coarse concentrating table. By the above process the grade of ore formerly shipped as screenings, running from 100 to 200 oz. per ton, and carrying about

70 per cent. of country rock is made to produce a high-grade product running from 1,500 to 2,000 oz. per ton, thus saving a heavy expenditure for freight and treatment charges on the bulk of the material formerly shipped. These operations are exceedingly satisfactory, only a very low-grade ore being sent to the dump for future treatment.

The question of erecting a more elaborate concentrating plant has been deferred for many reasons, amongst them being the prospect of the establishment of a local reduction works for the complete treatment of Silver-Cobalt ores. The results obtained from actual practice in the concentrating plants already established in the camp show losses varying from 15 to 25 per cent. of the assay value of the ores dealt with, while the resultant product has to bear the existing high rates of freight and treatment charges before net returns are reached. If treated to a finish at local reduction works at the minimum of cost with a saving of 98 per cent. to 99 per cent. of the assay values, a large tonnage of low-grade ore will be rendered available for profitable treatment, which, more particularly at the present low price of silver, will barely stand the cost of existing methods.

A test run of low-grade ore is being made at the present time through the mill of the Northern Concentrator Company at Cobalt, the results of which will be reported at the Annual Meeting, at which there will also be produced maps and plans showing the position of underground workings as at 31st December, 1908.

ALEX. M. HAY, President.

Toronto, Jan. 16th, 1909.

Shareholders of Temiskaming have received the following circular:—

"Whereas the Pennsylvania-Cobalt Silver Mines, Limited, is a corporation with an authorized capital stock of \$1,000,000, divided into 1,000,000 shares of the par value of \$1.00 each;

"And whereas this company is the holder of 499,997 fully paid shares of the said capital stock, and 300 shares of the said capital stock are also held by the nominees of this company;

"And whereas the directors authorized and directed B. E. Cartwright and Alexander Faskin to negotiate for the purchase of 500,000 fully paid-up shares of Pennsylvania-Cobalt Silver Mines, Limited, at a price not exceeding \$100,000;

"And whereas on the 20th day of October, 1908, the said Cartwright purchased the said 500,000 shares, the price to be paid being 100,000 fully paid shares of the capital stock of this company;

"And whereas the said purchase by the said Cartwright has been confirmed by the directors of the company, and R. A. Cartwright has, at the request of the company, paid to the vendors the 100,000 fully paid shares of the capital stock of this company, being the purchase price of the said stock so purchased;

"Now be it enacted as a by-law of this company that upon the said 500,000 fully paid-up shares of the capital stock of Pennsylvania-Cobalt Silver Mines, Limited, being transferred to this company, 100,000 fully paid-up shares of the capital stock of this company be issued and allotted to the said R. A. Cartwright or to his nominees. And further that the said shares so to be allotted shall carry dividends as and from the said 20 day of October, 1908, and that the dividend declared payable on January 1st next, to shareholders of record at the close of business on the 18th day of December, 1908, to be paid to the said R. A. Cartwright on the said 100,000 shares so to be issued to him as aforesaid on the first day of January, 1909.

"Passed this 5th day of December, A.D. 1909."

STATISTICS AND RETURNS.

CROW'S NEST COAL.

The Crow's Nest Pass Coal output for the week ending January 8th was 7,926 tons, compared with 23,379 tons last year.

The output of the Crow's Nest Pass Coal Company collieries for the week ending January 15th was 12,753 tons, making the daily average 2,125 tons. The general manager adds to his report that weather conditions were most unfavorable all week.

INTERCOLONIAL COAL MINING CO., LTD.

The output of the Intercolonial Coal Mining Company, Westville, N.S., for 1908, was 305,913 tons, as compared with 307,844 tons in 1907, a loss of 1,931 tons. Disposals for 1908 and 1907 were as follows:—

	1908. Tons.	1907. Tons.
Water sales	45,292 00-20	65,876 10-20
Rail sales	191,300 06-20	191,866 16-20
Land sales	7,857 07-20	7,423 16-20
Consumption	28,563 07-20	28,368 18-20
Coke ovens	6,581 00-20	14,227 00-20
Brick plant, etc.	935 00-20	1,637 00-20

A considerable quantity of small coal was placed on bank, due to the fact that there was no market for that grade, the iron works of the province being very dull. The importation of American bituminous coal into the Quebec market in 1908 reached figures which are a decided menace to the coal interests of the Maritime Provinces.

As regards 1909, it is anticipated that the output will be about the same as that of last year, and disposals will likely show up about the same figures.

THE CONSOLIDATED MINING & SMELTING COMPANY OF CANADA, LIMITED.

Smelter production for twelve months ending December 31, 1908:—

	Quantity.	Gross Value.	Per cent.
Gold	116,314 oz.	\$2,384,437	47.27
Silver	2,100,457 oz.	1,102,846	21.86
Copper	3,753,139 lbs.	506,460	10.04
Lead	35,999,145 lbs.	1,050,455	20.83

Total value \$5,044,198 100

Tons Smelted.

Lead furnaces	51,022
Copper furnaces	267,384

Total smelted 318,406

COBALT ORE SHIPMENTS.

Following are the weekly shipments from Cobalt camp, and those from January 1, 1909, to date:—

	Week ending	Since
	Jan. 9.	Jan. 1.
	Ore in lbs.	Ore in lbs.
Buffalo	44,020	44,020
Coniagas	35,630	109,690
Cobalt Central	40,000	40,000
Chambers-Ferland	80,000	80,000
City of Cobalt .....	.....	63,090
Kerr Lake .....	.....	61,000
La Rose	193,560	193,560
McKinley-Darragh	44,020	44,020
Nipissing	127,500	385,710
Nancy Helen	40,000	40,000
O'Brien .....	.....	124,325
Temiskaming & Hudson Bay	80,000	80,000
Muggley Concentrator	72,900	72,900

Ore shipments to date for 1909 are 1,164,725 lbs. or 582 tons. The total shipments for the week ending January 9 were 777,850 lbs., or 388 tons.

COBALT ORE SHIPMENTS.

Following are the weekly shipments from Cobalt camp, and those from January 1, 1909, to date:—

	Week ending	Since
	Jan. 16.	Jan. 1.
	Ore in lbs.	Ore in lbs.
Buffalo .....	.....	44,020
Coniagas .....	.....	109,690
Crown Reserve	120,000	120,000
Cobalt Central .....	.....	40,000
Chambers-Ferland .....	.....	80,000
City of Cobalt .....	.....	63,090
Kerr Lake .....	.....	61 000
La Rose	336,890	530,450
McKinley-Darragh	61,560	105,580
Nova Scotia	360,000	360,000
Nipissing	85,262	470,972
Nancy Helen .....	.....	40,000
O'Brien	63,840	188,165
Trethewey	60,000	60,000
Temiskaming & Hudson Bay .....	.....	80,000
Muggley Con. ....	.....	72,000

Ore shipments to date for 1909 are 2,292,277 lbs., or 1,146 tons.

Nova Scotia Mine shipped to Denver; La Rose to Denver and Copper Cliff; Crown Reserve to Denver and Copper Cliff; O'Brien to Denver; Trethewey to Carnegie; Nipissing to Balbach; McKinley-Daragh to Denver.

The official list of Cobalt shipments for the year has been compiled as follows by Mr. A. A. Cole, of the T. & N. Railway:

	Tons.
Buffalo	536.90
City of Cobalt	761.04
Chambers-Ferland	223.89
Cobalt Lake	225.97
Coniagas	610.25
Cobalt Central	276.79
Crown Reserve	657.35
Cobalt Silver Queen	885.70
Drummond	1,161.38
Foster	191.20
Kerr Lake	660.24
King Edward (Watts)	338.19
La Rose	4,843.17
McKinley-Darragh	1,808.39
Nipissing	3,571.96
Nova Scotia	237.95
Nancy Helen	201.32
O'Brien	3,459.51
Peterson Lake (Little Nipissing)	40.67
Provincial	75.84
Right of Way	750.04
Silver Bar .....	.58
Silver Cliff	160.44
Silver Leaf	197.03
Temiskaming	795.20
Temiskaming & Hudson Bay	1,094.23
Townsite	177.71
Trethewey	1,408.79
Victoria .....	.47
Casey Cobalt	10.00
Total	25,362.20

BRITISH COLUMBIA ORE SHIPMENTS.

Week Ending January 9th.

Nelson, Jan. 9.—The extreme cold spell has interfered with the mines in the Boundary, and all the properties have been forced to close down until the weather moderates. The ore shipments for the past week and year to date are as follows:—

Boundary—	Tons.
Granby	22,782
Snowshoe	3,586
Mother Lode	9,828
Oro Denoro	340
Sally	21

Total

Rossland—	Tons.
Centre Star	3,186
Le Roi	959
Le Roi No. 2	500
Josie Concentrates	84
Le Roi No. 2 (milled)	260

Total

Slocan Kootenay—	Tons.
Total	3,760

Total shipments for week and year to date are 45,306 tons.

The smelter receipts for the week are:—

	Tons.
Granby	22,752
Greenwood	10,168
Northport (Le Roi)	1,183
Trail	8,494

Total

The following are the ore shipments for the week ending January 16th and year to date in tons:—

Boundary—	Week.	Year.
Granby	7,871	30,653
Snowshoe	1,930	5,516
Mother Lode	2,562	12,390
Oro Denoro	290	630
Other mines .....	.....	21

Total

Rossland—		
Centre Star	386	3,572
Le Roi	623	1,582
Le Roi No. 2	82	582
Le Roi No. 2 (milled)	100	360
Other mines .....	.....	84

Total

Slocan-Kootenay—		
Total	1,640	5,400

The total shipments for the past week were 15,484 tons and for the year to date 60,790 tons.

Granby Smelter receipts, Grand Forks, B. C.:—

	Week.	Year.
Total	7,871	30,653

B. C. Copper Co.'s receipts, Greenwood, B. C.:—

Total	4,072	14,240
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Consolidated Co.'s receipts, Trail, B.C.:—

Total	1,333	9,827
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Le Roi Smelter receipts, Northport, Wash.:—

Le Roi	623	1,582
Other mines	272	496

Total

The total smelter receipts for the various smelters for the past week were 14,171 tons, and for the year to date 56,798 tons.

For week ending January 9th La Rose shipped to Denver and Copper Cliff; Nipissing to the Balbach Smelting Works, Newark; Nancy Helen, Cobalt Central, and Buffalo to Copper Cliff; Chambers-Ferland, and T. & H. B. to Denver; Coniagas to Thorold; McKinley-Darragh, and Northern Concentrators to Perth Amboy.

SILVER PRICES.

		New York.	London.
	1909.	cents.	pence.
January	7.....	51½	23 13-16
"	8.....	51¼	23 11-16
"	9.....	51½	23¾
"	11.....	52½	24 15-16
"	12.....	52½	24 3-16
"	13.....	52½	24¼
"	14.....	52½	24
"	15.....	52½	24½
"	16.....	52½	24 5-16
"	18.....	52½	24¾
"	19.....	52½	24½
"	20.....	52	23 15-16
"	21.....	51¾	23 11-16
"	22.....	51½	23¾

MARKET REPORTS.

January 22.—Connellsville coke, f.o.b., ovens:—

Furnace coke, prompt, \$1.60 to \$1.70.
 Foundry coke, prompt, \$2 to \$2.15.

Metals.

January 22.—Tin, Straits, 28 cents.
 Copper, prime Lake, 14.25 cents.
 Lake arsenical brands, 14 cents.
 Electrolytic copper, 13.87½ cents.
 Copper wire, 15.75 cents.
 Lead, 4.17½ cents.
 Spelter, 5.12½ cents.
 Sheet zinc, 7.50 cents.
 Antimony, Cookson's, 8.10 cents.
 Aluminium, 24 cents.
 Nickel, 40 to 47 cents.
 Platinum, \$22.50 to \$23.50 per ounce.
 Bismuth, \$1.75 per pound.
 Quicksilver, \$44.50 per 75-lb. flask.

MARKET NOTES.

A writer in the Wall Street Journal ascribes the recent advance in silver prices to a speculative market. Silverware manufacturers report goods in great demand. The arts require annually between 28,000,000 and 30,000,000 ounces. The requirement will therefore be extensive.

On the other hand, Cobalt alone produces 20,000,000 ounces yearly, and as silver is a by-product of copper and lead ores, it is difficult to restrict it.

The drop in prices from the high level of eighteen months ago has been about 20 cents per ounce. From this decline must be deducted the recent rise, and no great improvement can be expected for some time.

In spite of this opinion there is evident now a marked and sustained rise in the price of silver.