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CIRCULATION.

During the year ending with March 1st, 1908, 91,750 copies of THE CANADIAN MINING JOURNAL were printed and distributed, or an average of 3,822 per issue.

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NATURAL OIL AND GAS: Eugene Coste, M.E., Toronto, Ont.

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CANADIAN MINING INSTITUTE.

In many senses the recent annual meeting of the Canadian Mining Institute was unique. In respect of attendance it established, we believe, a new record. British Columbia, Ontario and Quebec were heavily represented, although Nova Scotia sent but one or two members.

The vote registered was large, larger in fact than on any previous occasion. The papers were of wide range, were well presented and intelligently discussed. The introduction of the plan of presenting a brief verbal outline of each paper instead of reading it in its entirety is to be commended.

The arrangements in nearly every particular went much more smoothly than is usual. The business meetings, at which much spirit, but little acrimony, was manifested, were well conducted. The smoker and the dinner were heartily enjoyed. In fine, the whole session was on of good-fellowship and harmony.

To the success of this Tenth Annual Meeting there were at least three contributory causes—the Ottawa committee, which spared no pains to perfect every detail in the scheme of entertainment; the Secretary of the Institute; and THE CANADIAN MINING JOURNAL. We modestly place ourselves in this category of moving causes for the reason that we believe our efforts responsible for awakening the paid officials of the Institute to the necessity of bestirring themselves. To use a homespun metaphor, we were as turpentine upon drowsing steeds.

The faithfulness of the chairman, Past President Frederick Keffer, who attended the meeting at great inconvenience, should be inspiring to officers and members alike.

THE SOUTH AFRICAN MINING JOURNAL.

Our enterprising contemporary, *South African Mines, Commerce and Industries*, has decided to shorten its title to *South African Mining Journal*. There is no question as to the wisdom and expediency of this decision. The former name is cumbersome. The latter is succinct.

South African mining men are under a heavy obligation to their leading mining journal for its recent successful organizing of a series of air drill contests. Under its new name we wish the *South African Mining Journal* enlarged usefulness and continued prosperity.

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TWO ESTIMATES.

In the *Mining World* of March 7th Mr. F. C. Nicholas takes exception to a polite request in a previous number of THE CANADIAN MINING JOURNAL for more information as to the way in which he obtained his valuation of the property and stock of the Bonanza Creek Gold Mining Company, Limited. As he accuses us of making "distorted quotations" from his article, we shall here quote from it verbatim.

"The gravel which can be worked is estimated at 30,000,000 superficial feet, and an average of 60 feet, with values in all of it placed at about \$3 per foot, measured from a superficial foot to bed rock 60 feet below the surface. At this estimates there is nearly \$90,000,000 gross in the property, equivalent to \$257 gross for each of the 350,000 shares of the company's stock. Operating expenses are estimated at 60 to 90 cents per superficial foot to bed rock, with 20 per cent. added for contingent expenses, resulting in a prospective return of \$164.56 net for each share. It is expected that it will take 30 to 40 years to work out the property, and at this rate the return expected is \$4.11, or about 80 per cent. annually on the stock. The maximum expectation is rarely attained in any mine, and often years are required to develop full efficiency. Taking the risk at Bonanza Creek as 25 per cent. assured, there will be 20 per cent. annually for the stock, with prospects for even better returns."

With regard to this Mr. Nicholas says in his reply to our enquiry, "As to the data on which the article was based I took them from reports made by members of my field staff who were with me last fall, but have now returned to Alaska, to be gone some time. In addition to these data I had information from parties interested in the property and from other engineers. From such information the article was written, and I am free to say that I endorse the reports made by the members of my staff with entire confidence.

"As to my estimates of share values to which THE CANADIAN MINING JOURNAL refers, the results are arrived at by careful investigations, such as I am constantly making for clients interested in mining securities. Naturally, my estimates of values are made by my own methods and on my own responsibility; and I am happy to say that a number of clients and others hold them in high esteem."

In order better to correlate this estimate with the estimate made by Mr. R. G. McConnell, of the Geological Survey of Canada, it is convenient to reduce the figures of quantity to cubic yards. Thus the amount of gravel here represented would therefore be roughly 66,000,000 cubic yards.

The property of the Bonanza Creek Gold Mining Company, Limited, appears to be located somewhere on the white gravel of the west side of the valley of Bonanza Creek, below the mouth of Adams gulch. But as

there are also several other properties on the same side of the valley, this property does not cover the whole of the white gravel.

Mr. McConnell writes of this as follows:—

"The volumes of gravel on the Upper Bonanza and Eldorado hills are as follows:—

| | Cubic yards. |
|-----------------------------|--------------|
| Bunker Hill | 1,050,000 |
| French Hill | 1,670,360 |
| Gold Hill | 3,684,940 |
| Chechaco Hill | 5,805,236 |
| Adams Hill | 7,561,370 |
| Magnet Hill | 485,672 |
| American Hill | 2,210,888 |
| Orofino Hill | 6,892,130 |
| Monte Cristo Hill | 3,710,490 |
| King Solomon Hill | 10,780,587 |
| Boulder Hill | 1,475,216 |
| | 45,326,889 |

Subtracting the quantity here stated as from Bunker Hill to Chechaco Hill, which are certainly higher up the valley of Bonanza Creek than the property of the Bonanza Creek Gold Mining Company, there remains, according to Mr. McConnell's determination a total of 33,116,352 cubic yards, only part of which is included in the property under consideration.

Continuing, Mr. McConnell writes:—

"A paystreak varying from 200 to over 400 feet in width has been traced through all these hills. It is partly destroyed in places, but on some of the hills, notably on Orofino and Monte Cristo, it is situated some distance back from the present secondary valley, and is entirely preserved.

"The paystreak is now practically drifted out, portions of it twice over, and is estimated to have yielded gold to the value of \$24,000,000.

"Drifting operations, however, never result in a full extraction of the gold. A few pillars and occasional small areas are usually neglected for various causes; the bed rock is seldom thoroughly mined, and no attempt is, of course, made to recover the values in the upper lean gravels. The paystreak gravels are also bordered as a rule on both sides by considerable fringes of gravel, too lean to drift but rich enough in most cases to hydraulick.

"The gravels in the Upper Bonanza hills, considered rich enough to be hydraulicked at a profit, include all those in the original paystreak, those in a band behind the paystreak varying in width on the different hills from 100 to 200 feet, and those between the paystreak and the present valley.

"The gravels in the back portion of most of the hills are too lean to be worked by any method.

"The volumes of workable gravels on the various hills are estimated as follows:—

| | Cubic yards. |
|--------------------|--------------|
| Bunker | 850,000 |
| French | 570,360 |
| Gold | 1,779,650 |
| Chechaco | 3,752,914 |
| Adams | 2,379,000 |
| Magnet | 395,677 |
| American | 1,989,218 |
| Orofino | 5,533,000 |
| Monte Cristo | 1,853,150 |
| King Solomon | 4,681,087 |
| Boulder | 332,000 |
| | 24,116,056 |

"The average values in these gravels are estimated at 34.05 cents per cubic yard and the amount of recoverable gold at \$8,213,532."

Deducting as before the quantity of gravel on the hills from Bunker Hill to Chechaco Hill, there remains a total of 17,163,132 cubic yards as the total volume

of the workable white gravel on the west side of Bonanza Creek. At Mr. McConnell's valuation of 34.05 cents per cubic yard, these have a total value of \$5,844,046.

Mr. Nicholas says: "I wish to avoid a controversy in this matter." But a request for an explanation of the difference in his gross valuation of \$90,000,000 for one property and \$5,844,046 for it and several other properties together, previously made by an accredited official of the Canadian Government, is deserving of fuller consideration than he has seen fit to give it.

SAFETY LAMPS.

The evidence being gathered by the English Royal Commission on Safety in Mines, among other recommendations makes several bearing upon the use of safety lamps. One important witness urges that the screw-locked lamps be entirely done away with and that safety lamps be standardized as nearly as possible. In all fiery mines the use and distributed quantities of explosives should be strictly controlled, as also the kind of explosive.

THE TENTH ANNUAL MEETING OF THE CANADIAN MINING INSTITUTE.

WEDNESDAY'S SESSION.

With every augury of success and with an exceptionally full registration of members, the Canadian Mining Institute opened its Tenth Annual Meeting at the Russell House, Ottawa, on the morning of Wednesday, March 4th. President Frederick Keffer, of Greenwood, B.C., presided. The attendance from Ontario, Quebec and British Columbia was more than usually heavy. Nova Scotia had but few representatives.

The Hon. William Templeman opened the first session on Wednesday morning with an address in which he dwelt appreciatively upon the work of the Institute and gave warm assurances of the support of the Department of Mines.

The following papers were read and discussed: "The Classification of Coal," by D. B. Dowling, Ottawa; "The Carbon Minerals of New Brunswick," Dr. R. W. Ells, Ottawa; "Secondary Mining Education," H. H. Stoek, editor of *Mines and Minerals*, Scranton, Pa.; and "Compilation of Mining Statistics," J. McLeish, Ottawa.

The paper read by Mr. D. B. Dowling on "The Classification of Coals" gave rise to much discussion, the result of which was that the President was requested to appoint a committee of five to investigate and report upon the laboratory methods of coal analysis. Dr. Ells' and Mr. McLeish's papers were also sources of profitable argument. After the methods of compiling mineral statistics in vogue in Ontario, Quebec and British Columbia had been taken up by Messrs. T. W. Gibson, J. Obalski and Dr. J. E. Woodman, it was resolved to request the Dominion Government to take the steps necessary to calling together representatives from each

of the Provincial Governments for the purpose of comparing and unifying the various divergent methods now in use. The afternoon and evening were also filled out with the reading and discussion of papers. The evening papers were illustrated by lantern slides. The slides prepared and used by Mr. D. B. Dowling in his paper on "Yellowhead Pass" were the subject of much favorable comment. Mr. E. D. Ingalls' paper on a "System of Conventional Signs for Showing Mineral Occurrences on Maps, etc.," also illustrated by slides, was original and ingenious.

THURSDAY'S SESSIONS.

The President's annual address included mention of the approaching visit of the British Iron and Steel Institute, to the increase in membership from 500 to 700 members during the year, and to the proposed establishment of technical libraries in mining centres.

The Treasurer's report, presented by Mr. J. Stevenson Brown, Montreal, showed the gross receipts for the year, including a balance of \$1,354 from 1906, of \$11,396. The disbursements amounted to \$7,923, leaving a balance on hand of \$3,472. The receipts included a Dominion Government grant of \$3,000, a Provincial grant of \$1,500, and membership fees, \$4,362.

After debate it was decided to change the form of the Treasurer's report so as to make it more specific and detailed.

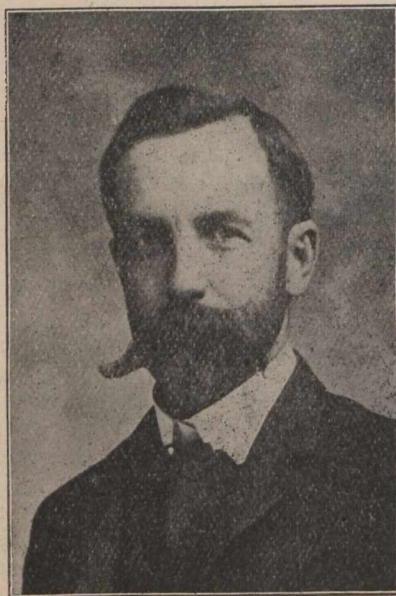
The report of the Secretary, Mr. H. Mortimer Lamb, referred to the establishment of three branches of the Institute: Western men at Nelson, with Mr. A. B. W. Hodges, Grand Forks, as President, and Mr. E. Jacobs, Victoria, Secretary; Cobalt Institute, Mr. A. A. Cole,

President and Mr. G. R. Harty, Secretary; and the Eastern Branch, at Montreal, with Mr. George E. Drummond as President and Mr. J. W. Bell as Secretary. Appreciation was expressed at the formation of the Federal Department of Mines and the increase of the Federal Government grant to the Institute from \$3,000 to \$5,000. Mr. Lamb reported that Mr. Frank E. Lathe, of McGill University had been awarded the President's gold medal for the best paper by a student member.

In the afternoon more papers were read. The evening was taken up with a thoroughly enjoyable smoker, arranged by the members of the Ottawa committee. The outstanding feature of the evening was the monologue given by Mr. Gordon Rogers and entitled "Mr. Dooley on Mining." Mr. Dooley's experience in the profession extended from buying "gumdrop" stock to sending a four-pound package of manuscript to THE CANADIAN MINING JOURNAL and having it returned collect.

FRIDAY'S SESSIONS.

The ballot box had closed at 6 p.m. on Thursday and results were expected early Friday morning. This, how-



Dr. Willett G. Miller, President C.M.I.

ever, was not to be. The large number of nominations and the ingenious complexity of the ballot form made the work of the scrutineers, Messrs. Brock, Wilson and Hobart, excessively tiresome.

On Friday morning the Institute unanimously placed itself on record as in favour of the renewal of the Dominion lead bounty. In discussing the motion, it was pointed out by Mr. J. C. Murray, editor of THE CANADIAN MINING JOURNAL, that the British Columbia Provincial coal tax, recently imposed upon the coal and coke of British Columbia, had a vital bearing upon the lead bounty. The tax itself would fall ultimately upon the metalliferous mines and would, in a sense, tend to neutralize the bounty. Hence both questions should be considered together.

The motion regarding the bounty was worded thus:—

"That this meeting, in continuation of the policy in the past, endorse the request of the lead miners and smelters of British Columbia, now before the Government, for an extension of the lead bounty act for a further period of five years, with an increase in the mini-

mum price of lead fixed by the bounty from \$80 to \$90 per 2,240 pounds."

The President is to appoint a committee to lay the matter before the Minister of Trade and Commerce.

Among other business transacted on Friday was the passage of the motion of Dr. A. E. Barlow, that a vote be taken by letter ballot on the proposed removal of the headquarters of the Institute from Montreal to Ottawa. Mr. John E. Hardman and Dr. Barlow were appointed a committee to write a circular explaining the reasons for and against the proposed change.

On motion of Mr. J. B. Tyrrell, seconded by Dr. T. L. Walker, it was decided to request the railways to grant reduced rates to prospectors. Prospectors were defined as the holders of mining licenses.

The reading of technical papers concluded the afternoon's work.

About six o'clock the results of the elections were announced as follows:—

President—Dr. W. G. Miller, Toronto.

Vice-Presidents—Mr. G. E. Drummond, Montreal; Mr. W. Fleet Robertson, Victoria, B.C.; Dr. A.E. Barlow.

Secretary—Mr. H. Mortimer-Lamb, Montreal.

Treasurer—Mr. J. Stevenson Brown, Montreal.

Councillors—Mr. W. M. Brewer, Victoria, B.C.; Mr. Arthur A. Cole, Cobalt, Ont.; Mr. D. H. Drury, Montreal, Que.; Mr. Chas. Fergie, Glace Bay, N.S.; Mr. J. E. Hardman, Montreal, Que.; Mr. R. T. Hopper, Montreal, Que.; Mr. A. J. McNab, Trail, B.C.; Mr. W. F. C. Parsons, Londonderry, N.S.; Mr. D. W. Robb, Amherst, N.S.; Mr. O. B. Smith, Phoenix, B.C.; Mr. R. H. Stewart, Rossland, B.C.; Mr. J. B. Tyrrell, Toronto, Ont.

The Annual Dinner, on Friday evening, concluded the best convention that the Institute has ever held.

Mining Science, February 20th.—Continuing his articles on slime concentration practice, Edwin A. Sperry writes of dewatering in this issue of *Mining Science*. Since there is mechanical loss wherever there is a current, Mr. Sperry believes that the use of canvas strakes, or "rag plants" are not as economical as settling tanks for dewatering. Two instances are cited. In one mill 180 tons of ore was crushed. The mill tails were screened on 20 mesh shaking screens. The undersize went to settling tanks, the overflow from which was 60 mesh and finer. This product amounted to 65 tons in 24 hours, carrying 4.7 per cent. of lead. 13.16 tons was caught in canvas and 51.84 tons wasted as tails. 48.4 per cent. of the total lead was wasted with the tails. 90.7 per cent. of the total lead would pass 200 mesh screen and, taking the retreatment of the canvas plant heads as a criterion, 80 per cent. of this could have been saved by dewatering and slime table treatment.

Other good points are made in the article. The conical Callow tank, 7 feet 7 inches high, with an effective width at the top of 8 feet, has a settling capacity of 20 gallons per minute in volume. The capacity for solid material depends, of course, upon the consistence of the pulp. With 10 per cent. solids 20 to 25 tons per 24 hours should be handled.

The liability of choking taking place at the apex of conical settling tanks is met by attracting an auxiliary chamber to the side of the tank in the form of a long tube having an opening into the tank for almost its entire length. The lower end is closed. At the upper end is a gland through which is inserted a pipe, the lower end of which reaches nearly to the lower end of the auxiliary chamber. This pipe is used as the draw off. It can be so manipulated as to remove clogging.

A CANADIAN METHOD FOR THE TECHNICAL DETERMINATION OF SILICON IN PIG IRON.

BY RANDOLPH BOLLING.

Chemist, Nova Scotia Steel & Coal Company, Sydney Mines, N.S.

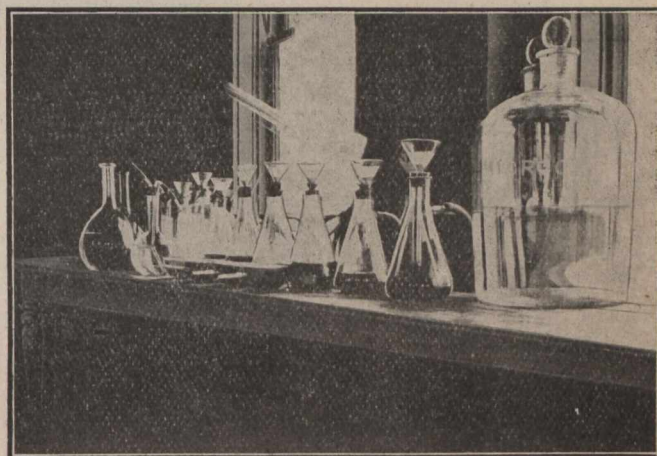
The writer contributes this article for the analytical readers and for the practical works chemist who is often required to perform much and to whom time is a necessary consideration.

On reading the interesting article in *THE JOURNAL* of January 15th on pig iron analysis, I was struck with the fact that the directions for the determination of silicon as given by the American Foundryman's Association could not be used in ordinary routine analysis at blast furnaces, except at great expense of time. A modern furnace makes from six to eight casts per day, and half of these are made during the night. The chemist usually finds three or four samples awaiting analysis in the morning, so that orders calling for certain grades of iron may be filled immediately, without rehandling. If one follows the foundryman's method (the American system), the hydrofluoric acid treatment of the residue would consume at least an hour beyond the actual time required for the other chemical reactions to separate silica from pig iron. The hydrofluoric treatment of the residue, in order to volatilize all of the silica, would appear necessary from a theoretical standpoint, as the argument could be advanced that the residue left after the solution, dehydration, and combustion would be contaminated with other substances than silica. Practical experiments by the writer extending over ten years on pig iron made in different localities in the United States and Canada show that under certain operating conditions, which I will describe later, not the smallest trace of any element except silicon was found in the residue. It volatilized completely when moistened with sulphuric acid and heated with a few cubic centimeters of hydrofluoric acid. The importance of this statement can be appreciated when it is recalled that silicon is the expensive constituent in pig iron. The difference of only one per cent. of this element in pig iron means a variation of from \$3 to \$4 per ton to the blast furnace. For instance, No. 4 usually contains from 0.85 to 1.20 per cent. silicon, No. 1 iron contains from 2.70 to 3.50 per cent. When iron is sold strictly on analysis No. 1 iron will always command from \$3 to \$4 higher per ton than No. 4. You may ask, why do the market prices of grades vary? The answer is simple—coke. In order that a blast furnace may produce No. 1 or comparatively speaking high silicon iron, the furnace manager is compelled in blast furnace parlance "to lighten the burden." This means that if he is running on basic, or No. 4, iron, with a certain ratio of coke to limestone and ore, he must reduce the weight of ore and limestone, *i.e.*, increase the ratio of coke to the rest of the charge in order that a higher temperature may develop in the zone of fusion in the blast furnace, reducing a greater amount of silica in this charge to silicon in the pig iron, and raising the percentage of silicon in the pig metal. The increase being a measure of the fuel used, it follows that the higher the silicon, the higher the cost of the metal producer, because of the increase in the cost of fuel. It thus follows that the accurate determination of the silicon contents of each cast is a matter of prime importance. The method the writer uses is a modification of the one suggested several years ago by Prof.

Drown, of the Massachusetts Institute of Technology, which became very popular owing to the simplicity of the operating details and the rapidity and accuracy attained. In fact, its use is almost universal.

METHOD FOR SILICON USED IN NOVA SCOTIA STEEL & COAL COMPANYS' LABORATORY.

A representative sample composed of fine drillings having been secured, a triple factor weight 1.4106 grams is carefully weighed on an analytical balance sensible to 1-20 mg. The sample must be picked up with a magnet of the horseshoe type from a sheet of paper in order that no sand from the skin of the sample pig should contaminate the sample when it was being drilled, previous to the weighing operation. This weighed portion is next brushed into a No. 3A Royal Berlin porcelain casserole, or other brand of casserole, which will hold approximately 300 c. cm. up to the spout. A clock glass of about 5 inches in diameter is placed on the casserole. Solution of the metal is now affected on a hot plate,

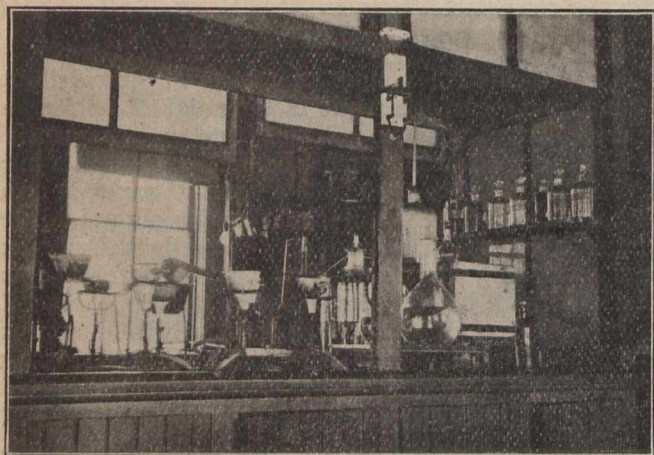


Heavy Glass Side Tube Erlenmeyer Flask Attached by Hose to Suction.

either electrically heated or by gas burner, by silicon mixture, which is prepared, *viz.*:

A No. 10 breaker is filled with 1200 c. cm. of distilled water. To this is added one liter of nitric acid, sp. gr. 1.42 C.P., and this mixture stirred with a glass rod. Now add in a very fine stream with vigorous stirring 400 c. cm. of sulphuric acid 1.84 sp. gr. C.P. The operation is best conducted in a sink with six or eight inches of water, as a very great rise in temperature follows the action of the sulphuric acid on aqueous solutions. This is the best silicon mixture formula. There is sufficient sulphuric acid to completely dehydrate the silica formed by the oxidizing action of the nitric acid. The triple fact or weight of metal requires 25 c.cm. of this mixture. The casserole is heated on the hot plate, so that a brisk effervescence of nitrous acid (deep brown fumes) proceeds without the contents boiling over. After ten or fifteen minutes solution is affected and is noted by a disappearance of the brown fumes and the solution subsides in the casserole and boils quietly. It is now ready for

an increase in temperature, a blue flame bunsen under a wire gauze is just the requisite heat, and the casserole is transferred from the hot place to the red hot gauze. The solution boils rapidly with a steady jet of steam issuing from the spout, the water is quickly evaporated, and as the last portions are driven out a slight spatter is heard to proceed from the casserole as a bumping action throws a little of the ferric sulphate and silica off the bottom against the glass cover. At this point dense white clouds of sulphuric anhydride are expelled and are quite readily manifested by an irritation of the operator's respiratory passages with a slight cough. This



Electric Hot Plate and Bunsen Burners.

is usually avoided by working under a laboratory fume hood with induced draught. A single drop of strong acid distilled from the residue will condense on the cooler cover and fall back again on the hot bottom of the casserole, with a hissing sound. This is the signal for removing the casserole from the flame and allowing it to cool. The residue is composed of anhydrous ferric sulphate, silica, a little scale sometimes, and iron phosphate, manganese sulphate and graphite. Hot water is now added to the extent of 200 c. cm. and the casserole again boiled. After solution of all soluble salts is observed 50 c. cm. of hydrochloric acid is added and the

boiling continued, in order to dissolve all iron compounds, insoluble in hot water, taking care to note if any particles show hydrogen bubbles, a sign that too coarse drillings have been used. If all is dissolved a liter erlenmeyer heavy glass side neck flask, with platinum cone and 3 inch funnel is fitted with a nine centimeter analytical filter paper. The S. & S. brand, black ribbon, is a favorite for this determination. The aspirator is started and the acid solution filtered and transferred by water jet from a washing flask. Some silica and graphite still adhere to the bottom and sides of the casserole. The most effective way to remove this deposit is to carefully cleanse the middle finger and gently rub the interior of the casserole until it appears perfectly white and clean. Rinsing off the tip of the finger with the water jet removes every particle of the adhering silica and graphite. Wash the funnel with hot water until all yellow ferric chloride is removed; then wash once with hydrochloric acid of 1.05 sp. gr. Any ferric salts will betray themselves at this point by a yellow discoloration on the paper or just back of the paper at its juncture with the glass walls of the funnel. Wash until every trace of ferric salts is removed. Remove acid from paper by three systematic hot water washings and allow the paper and residue to remain in the funnel to get rid of as much water as possible. A few minutes' suction does this. Remove filter paper and residue to a small 8 or 10 c.cm. weighed platinum crucible and heat over a small flame until the paper is charred. Now bring the crucible to incandescence heat over an air-gas blow pipe, and at the same time introduce a slow stream of oxygen gas through a tube in order to promote rapid combustion of the graphite. After the glow ceases, continue to heat and stir with a platinum rod until the silica appears white. Cool in a dessicator over dry calcium chloride, weigh, divide the weight of silica found by 3 and multiply by 100. The result is the per cent. of silicon in the sample. Oxygen compressed in steel tanks for calcium light apparatus is the most convenient source of gas and is cheap, its use for this purpose being distinctly novel.

Editor's Note.—Alternate washings with dilute ammonia, hot water, and dilute hydrochloric acid are to be recommended here.

MODES OF OCCURRENCE OF CANADIAN GRAPHITE.*

By H. P. H. BRUMELL, Buckingham, Que.

(Ottawa Meeting, 1908.)

Outside of those directly interested in the mining or geology of graphite the impression seems to prevail that this mineral invariably occurs in veins or nondescript masses. In view of the fact that all our deposits of permanent value are those of disseminated ore, the writer has undertaken to put together this brief paper on the subject with the hope that those interested in the industry will devote a little more attention to the development of some of our enormous deposits of comparatively low percentage disseminated ore, rather than to the exploitation of the higher percentage, and almost invariably erratic, deposits of so-called "pure lump."

The only ore under consideration in this paper is

that found in the Archæan rocks from which, solely, do we obtain any of the crystalline or flake variety, and the area covered will be that in which so much work has been done in the counties of Labelle and Argenteuil, in the Province of Quebec. In the former county the graphite is found most prominently in a more or less wide band of gneiss appearing near the front of the township of Templeton, whence it extends in a northeasterly direction into the township of Buckingham between the fourth and tenth ranges across which it sweeps, in a general easterly direction, into the township of Lochaber, where it turns again to the northeast, and so passes into the township of Mulgrave. In the county of Argenteuil the graphite occurs, almost invariably, in the limestones which are very strongly developed in the township of Grenville and those town-

*Journal of the Canadian Mining Institute. Part of Vol. XI.

ships to the north. These bands of limestone are bounded by large porphyry and syenite mass to the east, and by the granites of the Rouge River to the west. It will thus be seen that in these two countries the mineral occurs in two very distinctly different rocks. Not only do the rocks differ, but the ore also, that of Labelle county being mainly a disseminated ore, while that of Argenteuil occurs in veins and segregated masses; although the limestones, in the vicinity of these deposits, are often impregnated with disseminated scales of graphite to a considerable distance from the ore body.

To treat the subject in a broad sense and for convenience in this paper, the modes of occurrence may be briefly summarized as follows:—

1st. As disseminated ore, where the graphite occurs in small, bright, scaly crypto-crystalline particles, in a grey or red weathering gneiss, the particles lying parallel to the apparent stratification, or in larger similar particles in quartzite or coarse grained granite.

2nd. In the form of true fissure veins, usually cutting diorite or other eruptives.

3rd. As veins or irregular masses and contact repositories in limestone.

Of these three very distinct modes of occurrence the most important is, beyond all doubt, the first. These gneisses are very distinctly foliated and consist essentially of quartz and orthoclase with sillimanite, hornblende, pyroxene and pyrite, the latter mineral on weathering giving a reddish rusty appearance to the rocks. Interstratified with the gneisses are bands of crystalline limestone, frequently lenticular and not usually of great thickness. Dr. R. W. Ells—"Bulletin on Graphite"—says of the disseminated ores of Labelle county:—"The occurrence and association of the mineral are to a large extent the same at most of the places indicated. Certain local conditions are found here and there which must be considered in any mining scheme proposed, but generally it may be said that the chief attention as regards future developments must be made in connection with large bodies of the disseminated flake graphite, as promising the most steadfast returns. Though the vein form frequently occurs at most of the points where attempts to work the graphite have been made, and has shown in such cases a mineral of great purity, the uncertainty of such deposits is such that, by itself, the employment of capital on a large scale would scarcely be warranted.

"The most persistent of the graphite deposits, however, are those which are found as disseminated flake. In the Buckingham district, this variety is found usually in the grey mica gneiss in bands or beds, which sometimes have a thickness of from ten to fifteen feet, or in places even more, as well as in limestone. In some of these beds the graphite is very thickly distributed, and the rock is quite black from its presence, indicating a high percentage of the mineral. Several assays were made by Dr. Hoffmann in the Survey laboratory, some years ago, which were published in the report for 1876-77, and are as follows:—

'A specimen of disseminated ore from lot 28, range VI, Buckingham, owned by the Montreal Plumbago Company, the sample being regarded as a fair average of one of the largest and most extensively worked beds in the area, with a breadth of eight feet, gave by assay, graphite, 27.518; rock matter, 72.438 per cent. A sample from lot 22, range VI, Buckingham Mining Company, gave graphite, 22.385; rock matter, 75.875 per cent. Specimens from lot 20, range VIII, gave graphite,

23.798; rock matter, 75.026 per cent.; and from lot 23, range VI, graphite 30.516; rock matter, 69.349 per cent. In all the above occurrences the amount of disseminated ore seems to be large, and in some the presence of the vein variety is also recognized.

'It must not be supposed that all the disseminated ore occurs in beds as rich as those just mentioned, but at very many points deposits exist which give amounts of flake from large bodies of ore, which range from 10 to 15 per cent. or even higher.'

The foregoing is a very terse and accurate statement of facts, and it is to ores of this description that the energies of those at present engaged in the business are being bent. Already several extensive and characteristic deposits have been developed, notably those of the late North American Graphite Company, the Buckingham Graphite Company and the Bell Mines, all in Buckingham township, on whose properties are one or more extensive beds of graphite gneiss, assaying from 20 to 30 per cent. of graphitic carbon.

A very noticeable characteristic of most of the beds in the district is found at or near their contact with any of the later eruptives, where there is usually a very pronounced enrichment in graphite. This phase of the subject, however, need not be dwelt upon here.

Regarding the second or vein form of occurrence, but little need be said except that the deposits are true fissure veins, usually, in Labelle county, in diorite, at times continuing into the gneiss; in rare instances these veins have been noted in granite, pegmatite, pyroxenite and felsite. The graphite, which is of exceptional purity, occurs in fibrous and foliated forms, the fibres and plates lying at right angles to the enclosing walls, though in some rare instances the fibres and plates occur almost parallel to the walls and have the appearance of having drawn out by some dynamic action. In the latter instance the ore is usually harsh and lack-lustre. In one of the many veins opened on Lake Terror, where the ore occurs in a felsite, a vein of fibrous graphite about two inches in width gave every evidence of intense lateral pressure, the fibres being bent at the centre forming an angle of about 60 degrees without breaking the fibre. Of the purity of the vein graphite of Labelle county, the following assays by G. C. Hoffmann bear ample testimony.

"Vein graphite, foliated.—From a vein running through lots twenty-one and twenty-two of the seventh range of Buckingham. The structure of this graphite was massive, dense, made up of broad and thick laminae. Color dark steel grey. Lustre metallic. Specific gravity 2.2689, (containing 0.147 per cent. ash). Its composition was found to be as follows:—

| | |
|-----------------------|---------|
| Carbon | 99.675 |
| Ash | 0.147 |
| Volatile matter | 0.178 |
| | 100.000 |

"Vein graphite, columnar.—From the twenty-seventh lot of the sixth range of Buckingham. Structure of the graphite, compact, columnar; the columnar structure is usually erect, and at right angles to the surface upon which it occurs; in some instances, however, it is curved as though from pressure. The graphite breaks readily in the direction of the structure into more or less angular aggregates, each aggregate being made up of thin, narrow foliæ of very uniform width. The length of the columns varied in different specimens from about one

and a half to eight centimetres. In this specimen the foreign mineral matter was very evenly distributed through the structure of, and as a film upon, the graphite, so that on incineration the residual ash formed a tolerably perfect cast of the fragment employed. Color of untarnished foliae, dark steel grey. Lustre metallic. Specific gravity 2.2679 (containing 1.780 per cent. ash). Its composition was found to be as follows:—

| | |
|-----------------------|---------|
| Carbon | 97.626 |
| Ash | 1.780 |
| Volatile matter | 0.594 |
| | 100.000 |

Economically this form of graphite has not proved itself of value. The veins are small and very irregular, in no instance exhibiting any appreciable degree of persistence as to size, veins which, on discovery, appeared to warrant systematic operations, invariably pinching out or running off into numerous small pockets and stringers. Many attempts have been made to operate these deposits, but in no instance, within the knowledge of the writer, has the venture proved profitable.

In treating of the third mode of occurrence, that of deposits in crystalline limestone, as illustrated by all of those of Argenteuil county, it is, by reason of the small amount of development work done, extremely difficult to accurately describe the ore bodies. Scattered through the limestone are numerous irregular masses of a very pure foliated graphite, at times having all the appearance of true veins, though more frequently appearing as contact deposits in the neighborhood of small eruptive masses and dykes which cut the limestone at many points.

In writing of the property of the National Graphite Company, lot 9, range V, Grenville township, Dr. R. W. Ells describes a typical deposit as follows:—

“The country rock is for the most part crystalline limestone, which is cut by granite and other intrusives. The graphite usually occurs irregularly at, or near, the contact of the limestone with granite or diabase dykes, both rocks being present in the openings, also in irregular vein forms, which are massive rather than columnar in character, ranging in thickness from fifteen inches to two feet. These are not solid, but apparently sometimes in dyke matter.

“Several openings have been made on the property. In the main pit the rocks are limestone with bands of rusty gneiss, which are traversed by a white granite dyke and this in turn by a dyke of light green diabase. The graphite occurs principally in two irregular veins, and also in the granite mass, and these is a small vein on the edge of the diabase. The veins are shattered and mixed with a whitish, sometimes reddish, granite.

“The granitic looking rock has somewhat the aspect of a vein in some respects rather than a true dyke. It carries several minerals including scapolite, hornblende, graphite, pyroxene, pyrite, apatite and others. South of the principal opening, where mining has been carried on, the surface rocks for some distance appear to be all limestone, and in several small prospecting pits, sunk in this rock, a small percentage of disseminated flake graphite was observed.”

The ore of Argenteuil county is of a very high degree of purity as is evidenced by the following assays by G. C. Hoffmann:—

“Vein graphite, foliated.—From the north half of the third lot of the second range of the Augmentation of

Grenville. An exposure here was at one time mined to a small extent. At the opening of the excavation it showed a thickness of about ten inches, but the pure graphite was found to form a lenticular mass, which appeared to be separated from other masses of the same character by intervals, in which the graphite became intermixed with the limestone. Structure massive, dense, made up of broad and thick laminae, closely interlocking each other at diverging angles, thus presenting a radiated arrangement, the sides of the vein forming the basal line. Color, dark steel grey. Lustre metallic. Specific gravity 2.2714 (containing 0.076 per cent. ash). Its composition was found to be as follows:—

| | |
|-----------------------|---------|
| Carbon | 99.815 |
| Ash | 0.076 |
| Volatile matter | 0.109 |
| | 100.000 |

The graphite, as well as occurring in veins and contact deposits of various forms, is found at times in the limestone in the shape of almost perfect spheres, concretionary in form, the plates of fibres of graphite radiating from a centre consisting of a small particle of quartz or other foreign mineral. These concretionary spheres range in size from about one-tenth of an inch to two inches in diameter, and do not appear to follow any apparent bedding of the limestone, but to be scattered irregularly therein.

In summing up the three modes of occurrence it is not thought necessary to draw attention to specific failures to operate profitably the last two classes of deposits, but it may be said, in a general way, that, without exception, no deposit of vein or “pure lump” graphite has been found, on development, to be worthy of consideration as a commercial venture.

This conclusion was foreshadowed by Sir W. E. Logan who, in 1866, concluded his report to the Geological Survey by saying:—“The veins of this mineral hitherto found in the rocks of this country, although affording a very pure material, appear to be too limited and too irregular to be exclusively relied on for mining purposes, which should rather be directed to making available the large quantities of graphite, which, as we have seen, are disseminated in certain beds.”

The *Iron and Coal Trades Review*, February 28th.—In an editorial on the eight hours question, the *Review* demonstrates that there is no reasonable analogy between the miners' eight hour bill and other measures designed to promote the welfare of miners. As to the certain effects of this bill it is shown that, whilst safety will not be increased, output will be lessened and the enhanced cost of production will react very strongly upon the market price. Moreover, many mines now working thin seams will be unable to face competition and will therefore be closed, thus throwing hundreds of workers out of employment. This argument is strengthened by the fact that not only is the cost of producing a ton of coal increasing under present condition; but the per capita output of the mines is decreasing. And this is the case in spite of vastly improved appliances, equipment, sanitation and transportation.

NOTES ON COST OF DIAMOND DRILLING IN THE BOUNDARY DISTRICT.*

BY FREDERICK KEFFER, Greenwood, B.C.

(Nelson Meeting, January, 1908.)

Two years ago I contributed to the Institute a paper on the results of diamond drilling as carried on at the mines of the British Columbia Copper Company, Limited, during 1905. That paper gave some details as to costs, and the period covered was but eight and one-half months. Since that year drilling has been carried on more or less continuously in the mines of the company, and the results of this work, so far as progress and costs are concerned, are given in detail in the following tables.

The Progress Table gives the monthly results of work as well as the yearly totals. It is of course important to know the general character of the rock drilled in order to institute comparisons with other localities. In the narrow limits of this table it is not possible to give details as to rocks, but as nearly as possible the rocks comprise diorites, compact garnetites and certain very hard and silicious eruptives occurring in Summit camp. The medium hard rocks include all ores, and, in Deadwood camp, much of the greenstone country. The soft rocks are the limestones, porphyries and serpentines. Of all rocks drilled the garnetites proved much the most severe in diamond consumption, as is illustrated by the work

from May to August, 1907, which was mainly conducted in garnetite with some silicious limestones.

Eight hours constitute a shift underground, and nine hours on the surface. On Sundays no work is done apart from repairs to machinery. In May, 1906, the labor was contracted as an experiment, but was abandoned as being unsatisfactory.

The Cost Table gives details of costs under the four groups of Labor, Power, Repairs, Oils, etc., and diamonds. The employees were, normally, a runner and a setter. Extra help was required at times for blasting places for good set ups, for laying pipe lines, moving plant, etc. In August, 1907, two shifts were employed. In June and July of that year the increase in labor costs is mainly on account of the long pipe lines required. The power consumed is taken as being equivalent to that required for a 3 1/4 inch machine drill, that is to say, about 20 h.p. When drilling at a mine, where for example 15 machines are used on each shift, the diamond drill is charged with 1/31 of the total power costs—it being in this instance run on one shaft only.

Where steam power is used either directly or through a steam driven air compressor, the costs are much increased. Where, as in some cases, an isolated 24 h.p.

*Journal of the Canadian Mining Institute. Part of Vol. XI.

PROGRESS TABLE.

| Date | Depth of Holes. | | | Hours actual drilling. | Hours moving to new holes, setting bits, etc., etc. | Total hours | Number of holes. | shifts | Feet per shift. | Feet per drilling hour. | Character of Rock. | Remarks. |
|------------|-----------------|------------------|-------------|------------------------|---|-------------|------------------|--------|-----------------|-------------------------|----------------------------|---|
| | Vertical feet. | Horizontal feet. | Total feet. | | | | | | | | | |
| 1906 | | | | | | | | | | | | |
| Jan. ... | 170 | 0 | 170 | 106 | 46 | 152 | 6 | 19 | 8.94 | 1.60 | Mainly hard diabase | No. |
| Feb. ... | 0 | 191 | 191 | 104 | 24 | 128 | 3 | 16 | 11.93 | 1.83 | Softer lime rock | 1=Hard rocks 2=Medium hard rocks 3=Soft rocks |
| March .. | 332 | 66 | 398 | 205 | 77 | 282 | 5 | 33 | 12.06 | 1.94 | Equal parts of above rocks | 2 |
| April ... | 214 | 0 | 214 | 76 | 55 | 131 | 7 | 16 | 13.37 | 2.81 | Lime rocks and ore | 2 |
| *May ... | 390 | 73 | 463 | | | | 4 | | | | Nearly all in ore | 2 |
| June ... | | | 0 | | | | | | | | | No work in June and July. |
| July ... | | | 0 | | | | | | | | | |
| Aug. ... | 0 | 508 | 508 | 160 | 48 | 208 | 7 | 26 | 19.59 | 3.17 | Fairly hard rock | 2 |
| Sept. ... | 0 | 96 | 96 | 29 | 3 | 32 | 0 | 4 | 24.00 | .31 | Mainly ore | 2 Drill men off on vacation. |
| Oct. ... | 195 | 40 | 235 | 95 | 53 | 148 | 4 | 17 | 13.82 | 2.45 | do. | 2 |
| Nov. ... | 33 | 378 | 411 | 157 | 63 | 220 | 6 | 27 | 15.22 | 2.62 | Hard silicious rock | 1 |
| Dec. ... | 189 | 127 | 316 | 144 | 48 | 192 | 3 | 24 | 13.17 | 2.19 | do. | 1 |
| | 1523 | 1479 | 3002 | 1076 | 417 | 1493 | 45 | 182 | Av. 13.59 | Av. C. .359 | | C.—Averages calculated on 3002 ft. less 463 drilled on contract. |
| 1907 | | | | | | | | | | | | |
| Jan. | 246 | 165 | 411 | 159 | 57 | 216 | 6 | 27 | 15.22 | 2.58 | Lime and porphyry | 3 |
| Feb. | 0 | 378 | 378 | 137 | 79 D | 216 | 2 | 27 | 14.00 | 2.76 | Ore and limy rock | 2 D.—Several days lost moving 15 miles to another mine |
| March ... | 200 | 340 | 540 | 180 | 28 | 208 | 5 | 26 | 20.77 | 3.00 | do. do. | 2 |
| April ... | 278 | 186 | 464 | 181 | 27 | 208 | 1 | 26 | 17.86 | 2.56 | do. do. | 2 |
| May. ... | 67 | 433 | 500 | 163 | 53 | 216 | 3 | 27 | 18.52 | 3.07 | Hard garnetite | 1 |
| June ... | 189 | 288 | 477 | 187 | 39 | 226 | 6 | 26 | 18.34 | 2.55 | Very hard garnetite | 1 |
| July. | 96 | 304 | 400 | 203 | 23 | 226 | 6 | 27 | 14.81 | 1.97 | do. do. and diorites | 1 B.—Much trouble with caving ground in August. Worked two shifts nearly all the month. |
| Aug. ... | 497 | 0 | 497 | 213 | 129 B. | 342 | 8 | 38 | 13.18 | 2.33 | do. do. | 1 |
| | 1573 | 2094 | 3667 | 1423 | 435 | 1858 | 37 | 224 | Av. 16.34 | Av. 2.577 | | |

(*) This month's work was contracted as to the labor. Feet drilled are therefore not included in averages, as contractor worked overtime.

boiler was used, the power costs are still higher, as an engineer has to be provided as well as a team to haul wood.

Tools, repairs, etc., include these items as well as all small miscellaneous expenses. The increasing cost of diamonds added materially to cost per foot in 1907.

The third table is a summary of the first two, and shows an average cost per foot for the two years of \$1.705. The carats used per foot are 0.572-64, or in more intelligible decimals, .00893 carats, so that one carat

on the average drilled 111.9 feet. All holes over 30 degrees dip are classed as vertical, and feet per hour in horizontal holes is about 15 per cent. greater than in vertical ones. The average depth of holes is 81.3 feet, and diameter of cores is 7-8 inch.

In comparing these costs with contractors' prices, it must be borne in mind that contractors usually require air (or steam) and water to be piped to the work, and the mine must in addition furnish the air and water free of charge. In the present cost sheets all these items are charged against costs of drilling.

COST TABLE.

| Date | Labor cost | Cost per foot | Power | | | Repairs, Oils, etc. | Cost per foot | Diamonds | | | | Total Costs | Total per foot | Feet drilled | Remarks | |
|-------|------------|---------------|---------------|--------|--------------|---------------------|---------------|-------------|--------------|---------|--------------|-------------|----------------|--------------|---|--|
| | | | Kind | Cost | Cost per ft. | | | Carats used | Market price | Cost | Cost per ft. | | | | | |
| 1906 | | | | | | | | | | | | | | | | |
| Jan. | 172.00 | 1.012 | Elec. A. | 36.30 | .213 | 22.72 | .133 | 61/64 | 56.53 | 53.99 | .318 | 285.01 | 1.676 | 170 | A.—"Electric power" is compressed air from electric driven compressors. Costs reckoned on assumption that diamond drill consumes as much power as a machine rock drill; that is approximately 20 H.P. | |
| Feb. | 152.50 | .798 | do. | 32.10 | .165 | 7.01 | .036 | 3.47/64 | " | 206.70 | 1.082 | 398.31 | 2.081 | 191 | | |
| March | 292.00 | .734 | ½ do. ½ steam | 112.20 | .282 | 68.60 | .172 | 3.35/64 | 60.07 | 213.07 | .535 | 685.87 | 1.723 | 398 | | |
| April | 188.87 | .882 | Elec. | 31.58 | .147 | 26.93 | .126 | 1.59/64 | " | 115.45 | .539 | 362.83 | 1.694 | 214 | | |
| May | 480.48 | 1.037 | do. | 38.83 | .083 | 19.41 | .042 | 5.36/64 | " | 334.15 | .722 | 872.87 | 1.885 | 463 | Labor contracted this month No drilling done | |
| June | | | | | | | | | | | | | | | Do. | |
| July | | | | | | | | | | | | | | | Do. | |
| Aug. | 269.25 | .530 | do. | 52.95 | .104 | 30.67 | .060 | 3.25/64 | 60.07 | 203.68 | .401 | 556.55 | 1.095 | 508 | Drill men on vacation | |
| Sept. | 52.85 | .551 | do. | 5.07 | .053 | .00 | .00 | .46/64 | " | 43.17 | .449 | 101.09 | 1.053 | 96 | | |
| Oct. | 183.60 | .781 | do. | 51.12 | .217 | 2.29 | .009 | 2.19/64 | 61.90 | 141.70 | .600 | 378.71 | 1.610 | 235 | | |
| Nov. | 280.10 | .681 | Steam | 127.42 | .310 | 118.18 | .288 | 2.40/46 | " | 160.50 | .390 | 686.20 | 1.669 | 411 | Drill operated most of Nov. and Dec. by steam direct from boiler. | |
| Dec. | 288.00 | .911 | Steam | 128.32 | .406 | 34.21 | .108 | 4. 8/64 | " | 255.24 | .808 | 705.77 | 2.233 | 316 | | |
| | 2359.65 | Ave. .786 | | 615.89 | Ave. .205 | 330.02 | Ave. .109 | 28.56/64 | | 1727.65 | Ave. .576 | 5033.27 | Ave. 1.676 | 3002 | | |

COST TABLE.—Continued.

| Date | Labor cost | Cost per foot | Kind | Power | | | Repairs, Oils, etc. | Cost per foot | Diamonds | | | | Total Costs | Total per foot | Feet drilled | Remarks |
|-------|------------|---------------|--------|---------|--------------|-------------|---------------------|---------------|--------------|---------|--------------|---------|-------------|----------------|---|---------|
| | | | | Cost | Cost per ft. | Carats used | | | Market price | Cost | Cost per ft. | | | | | |
| 1907 | | | | | | | | | | | | | | | | |
| Jan. | 264.25 | .643 | Steam | 236.24 | .575 | 13.3 | .032 | 1. 3/64 | 61.90 | 62.89 | .153 | 576.75 | 1.403 | 411 | Great advance in price of diamonds. | |
| Feb. | 245.10 | .648 | Elec. | 68.60 | .182 | 5.45 | .014 | 1.50/64 | 80.00 | 141.70 | .375 | 460.85 | 1.219 | 378 | Best month on record for low total costs. | |
| March | 265.75 | .492 | do. | 53.34 | .099 | 26.23 | .049 | 2.37/64 | " | 219.14 | .405 | 564.46 | 1.045 | 540 | | |
| April | 277.90 | .599 | do. | 51.13 | .110 | 7.3 | .015 | 3.18/64 | " | 262.50 | .566 | 598.84 | 1.290 | 464 | | |
| May | 332.00 | .664 | do. | 58.85 | .117 | 6.38 | .013 | 5. 4/64 | " | 405.48 | .810 | 802.71 | 1.604 | 500 | | |
| June | 397.55 | .833 | do. B. | 175.00 | .367 | 47.92 | .100 | 5.16/64 | 71.75 | 376.36 | .790 | 996.83 | 2.090 | 477 | B.—Increase in power cost due to partial closing of mine throwing more costs on the power for diamond drilling. | |
| July | 402.56 | 1.006 | do. B. | 182.25 | .455 | 164.83 | .412 | 7. 3/64 | " | 511.88 | 1. 79 | 1261.52 | 3.153 | 400 | June, July & August were drilling in very hard garnetite increasing diamond consumption. | |
| Aug. | 439.22 | .883 | do. B. | 200.00 | .403 | 93.78 | .189 | 4.44/64 | " | 342.77 | .689 | 1075.77 | 2.164 | 497 | | |
| | 2624.33 | .715 | | 1025.41 | Ave. .280 | 365.27 | Ave. .100 | 30.47/64 | | 2322.72 | Ave. .633 | 6337.73 | Ave. 1.728 | 3667 | | |

SUMMARY.

PROGRESS.

| Year | Feet Drilled. | | | Total | Hours. | | | Number of Holes | Number of Shifts | Feet per Shift | Feet per Drilling Hour |
|------|---------------|---|----------|-------|-------------|-------|----|-----------------|------------------|----------------|------------------------|
| | Vertical | Horizontal | Drilling | | Moving, &c. | Total | | | | | |
| 1906 | 1523 | 1479 | 1076 | 3002 | 417 | 1403 | 45 | 182 | 13.59 | 2.359 | |
| 1907 | 1573 | 2094 | 1423 | 3667 | 435 | 1858 | 37 | 224 | 16.34 | 2.577 | |
| | 3096 | 3573 | 2499 | 6669 | 852 | 3351 | 82 | 406 | 15.285 | 2.482 | |
| | | Contract feet | | 463 | | | | | A. | B. | |
| | | Feet used in calculating averages A. and B. | | 6206 | | | | | | | |

COSTS.

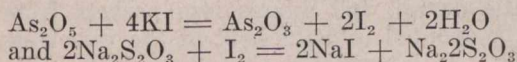
| Year | Labour | | Power | | Repairs, Oil, &c. | | Diamonds | | | Totals | | Feet |
|------|---------|-----------|---------|-----------|-------------------|-----------|----------------------|---------|-----------|----------|------------|---------|
| | Cost | Per ft. | Cost | Per ft. | Cost | Per ft. | Carats | Cost | Per ft. | Cost | Per ft. | Drilled |
| 1906 | 2359.65 | .786 | 615.89 | .205 | 330.02 | 109 | 28.56/64 | 1727.65 | .576 | 5033.21 | 1.676 | 3002 |
| 1907 | 2624.33 | .715 | 1025.41 | .280 | 365.27 | 100 | 30.47/64 | 2322.72 | .633 | 6337.73 | 1.728 | 3667 |
| | 4983.98 | Ave. .747 | 1641.30 | Ave. .246 | 695.29 | Ave. .105 | 59.39/64 | 4050.37 | Ave. .607 | 11370.94 | Ave. 1.705 | 6669 |
| | | | | | | | Carats used per foot | 0.572 | | | | |
| | | | | | | | | 64 | | | | |

A RAPID METHOD FOR THE ESTIMATION OF ARSENIC IN ORES.*

By HARTLEY E. HOOPER, Associate.

The following method was arrived at after exhaustive trials of the usual volumetric and gravimetric processes, which were all found to be either too slow and tedious, or to require too much delicate manipulation for rapid technical work. It is suitable for sulphide or oxidized ores containing upwards of 1 per cent. of arsenic. Such ordinary constituents of the ores as lead, copper, zinc, iron, manganese, or nickel do not interfere, being either precipitated as oxides or else having no reaction with the iodine thiosulphate titration.

The reactions which take place are as follows:—



The solutions required are:—

$\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ 33.1 grm. per litre
then 1cc. = 0.005 grm. of arsenic.

Sodium hydrate 25 per cent. solution.

The sodium thiosulphate may be standardized either against copper or arsenious oxide.

Copper.—Take 0.3 grm. of copper, dissolve in 10 cc. dilute nitric acid, boil off nitric fumes, add ammonium hydrate till just alkaline, boil off the excess of ammonia and then add 1 cc. of glacial acetic acid, cool, add potassium iodide and titrate with sodium thiosulphate. Then the copper value multiplied by 75 and divided by 127.2 gives the arsenic value of the solution.

Arsenious Oxide.—Take 0.264 grm. of pure arsenious oxide, add 5 cc. of concentrated nitric acid, evaporate to dryness and heat strongly for a few minutes, take up 25 cc. with sodium hydrate solution, warm and then make up the bulk of the solution to 50 cc., neutralize with concentrated hydrochloric acid and then add 25 cc. in excess, cool, add potassium iodide and titrate until the solution becomes perfectly colorless. Test the solution with starch, and if it shows any deep blue coloration the standard must be repeated.

Treatment of Ore.—For ores containing about 20 per cent. of arsenic take 0.5 grm., place in a 12 ounce tumbler beaker and add 10 to 15 cc. of a moderately strong solution of potassium chlorate in concentrated nitric acid, evaporate gently to complete dryness and allow to heat for a few minutes to get rid of all oxidizing matter. Cool, add 10 cc. dilute ammonium hydrate, bring to boiling to disintegrate the mass and then add 25 cc. of the sodium hydrate solution; boil again and filter hot, and wash with hot water. The filtrate should not exceed

50 cc.—if it does, evaporate down to about 50 cc.; neutralize with concentrated hydrochloric acid and treat as in standard.

Notes on the Method.—The proportion of hydrochloric acid to the bulk of the assay should be about one-half or three-fifths; if less acid be present a reverse reaction sets in, the arsenious oxide being oxidized to arsenic oxide, shown by the color going and coming during the titration. If too much hydrochloric acid be present the potassium iodide will not dissolve and the sodium thiosulphate is decomposed and sulphur is precipitated, disguising the finish. The titration should be done slowly, especially towards the finish, and if the yellow color returns a few drops of thiosulphate will discharge it, and the higher reading should be taken.

The starch indicator is of no use in the titration, but may be used to confirm the finish. In the strong hydrochloric acid solution the thiosulphate will not discharge the starch color. For exact work it is advisable to take a blank assay of water and hydrochloric acid in the right proportions, add potassium iodide and titrate. This is to allow for any free chlorine being present in the acid.

If antimony be present, instead of dissolving the ore in nitric acid it should be fused with sodium peroxide in a nickel crucible, the alkaline water extract being treated as before.

The following experiments were performed to test the accuracy of the method:—

The Use of Starch Gave the Following Results.—50 cc. of water plus 30 cc. hydrochloric acid plus potassium iodide took 0.1 cc. of standard thiosulphate, giving an instant finish, and, on the addition of starch, no color. Similar amounts using starch required from 0.5 cc. to 1 c.c. and then would show no definite finish.

Effect of Varying Hydrochloric Acid.—A solution of sodium arsenate in water containing the equivalent of 0.1 grm. of arsenic in 50 cc. was in each case.

| Arsenic solution. | Hydrochloric acid. | Thiosulphate required. |
|-------------------|--------------------|------------------------|
| 1. 50 cc. | 10 cc. | 22.1 cc. |
| 2. 50 cc. | 25 cc. | 22.2 cc. |
| 3. 50 cc. | 30 cc. | 22.2 cc. |
| 4. 50 cc. | 50 cc. | about 22.0 cc. |

In (1) the color went and came during the titration.

In (2) the finish was fairly sharp, but the starch gave a color on standing.

In (3) the finish was sharp, and the starch gave no color on standing.

In (4) the potassium iodide did not dissolve until well on with the titration, and towards the end the thiosulphate was decomposed, precipitating the sulphur and disguising the finish.

*A paper read before the Institution of Mining and Metallurgy.

Effect of Varying Sodium Chloride:—

| Arsenic solution. | Hydrochloric acid. | Sodium chloride. | Titration. |
|-------------------|--------------------|------------------|------------|
| 1. 50 cc. | 30 cc. | 2.5 grm. | 22.1 cc. |
| 2. 50 cc. | 30 cc. | 5 grm. | 22.2 cc. |
| 3. 50 cc. | 30 cc. | 10 grm. | 22.15 cc. |
| 4. 50 cc. | 30 cc. | 20 grm. | 22.2 cc. |

In (3) the sodium chloride only dissolved during the titration, and in (4) a considerable portion was left undissolved, rather disguising the finish.

Effect of Potassium Chlorate.—A blank assay was done using 15 cc. of the nitric acid potassium chlorate solution and evaporating to dryness. The titration required only 0.1 cc. of standard thiosulphate.

The Moose Mountain Iron Range, with Special Reference to the Properties of Moose Mountain, Limited.*

By NORMAN L. LEACH, Sudbury, Ontario.

(Ottawa Meeting, March, 1908.)

The conformation of the Moose Mountain Iron Range has been traced in a general manner and found to extend in a northwesterly direction from the northwest shore of Lake Wahnapiatae, in the district of Nipissing, to Onaping Lake, in the district of Algoma, a distance of approximately thirty-five miles.

Twenty-five miles due north of Sudbury, in the township of Hutton, are situated the properties of the Moose Mountain, Limited. The existence of iron ore in this township has been known in a general way for years. During the gold excitement of the "nineties," prospectors travelling the West Branch of the Vermilion River, in search of the yellow metal, portaged across a ridge of the "No. 2" deposit at a point known as the "Iron Dam," the wearing away of the moss on the portage having exposed the ore in several places.

In 1901 and 1902 Sudbury prospectors, though Mr. Chase S. Osborne, of Sault Ste. Marie, Michigan, succeeded in interesting Mr. John W. Gates, of New York, and associates, in the property. Enough exploratory work was then done to prove its value and negotiations commenced with the object of securing rail connections with the Georgian Bay.

Messrs. Mackenzie & Mann, appreciating the possibilities of the ore tonnage as a source of revenue for their railroads, became interested in the property, and as a result a branch of their Canadian Northern Ontario Railway, from Toronto to Sudbury, has been built from Sudbury North to the mines, a distance of 35 miles. A six mile spur from the main line, a few miles south of the French River, has been constructed to the Georgian Bay at a point known as Key Inlet, and is the final link connecting the mines with the Great Lakes, making a rail haul for the ore of about eighty miles, or about the same average haul of the three iron-ore-carrying roads of Minnesota.

Ore docks for the transshipment of the ore are now under construction by the Mackenzie & Mann interests at the "Key." A splendid natural harbor has been secured there with twenty-four feet of water alongside the ore docks, more than enough to float the largest vessels on the Great Lakes; and the "Key" as a shipping point by water is 500 miles nearer any of the iron ore receiving ports, as compared with shipments from the head of Lake Superior. This will be a considerable factor in the securing of favorable lake freight rates.

The docks are of unique construction, and will be unlike any on the Great Lakes for the handling of iron ore. The ore from the mines, loaded in hopper-bottomed cars, is dumped from a trestle to a stock pile ground beneath. Under this stock pile ground, in line with the centre line of the trestle, is a tunnel through which a forty-two inch belt will convey the ore to a similar belt at the water's edge, which in turn conveys and elevates the ore to the dock trestle, sixty feet above the water level. It is then tripped off the belt, weighed by an automatic device, and dumps into pockets from which it will be spouted into the hold of the vessels alongside the dock. It is expected that these belts will have a capacity of eight hundred tons of ore per hour.

Development work at the properties of the Moose Mountain, Limited, has proven the existence of several large deposits of merchantable ore, principally magnetite, and a small amount of hematite. The ores occur in the following rocks of the Keewatin age. Those in close proximity to the ore bodies consist principally of diorite, diabase, hornblende-schist, hornblende-gneiss, all of which may be collectively referred to as greenstone. In a few instances granite comes into contact with the ores. Numerous exposures of magnetic ores are to be found. Where weathered the ore presents grey, dark green and black appearances, and for shipment the ores have a steel grey appearance. These ores can be delivered to any blast furnaces in Canada or the United States, tributary to the Great Lakes, and the product from the Moose Mountain mines will be disposed of in the above markets.

The present guaranteed analysis on ore sales is:—

| | |
|------------------|--------|
| Iron | 55. 50 |
| Phosphorus | . 10 |
| Silica | 13. 29 |
| Manganese | . 02 |
| Alumina | 1. 21 |
| Lime | 3. 60 |
| Magnesia | 3. 15 |
| Sulphur | .011 |
| Titanium | none |
| Moisture | 1. 00 |

So far actual mining operations have been confined to "No. 1," or original "Moose Mountain" deposit. The surface of the ore body at this point is approximately 140 feet above the level of the railroad loading tracks. The ore is won by overhand stoping, from an open face of from 60 to 70 feet in height, trammed out to a large chute discharging thirty feet below the level

*Journal of the Canadian Mining Institute. Part of Vol XI.

of the bottom of the present stope into a No. 8 Austin gyratory crusher, which reduces it to a maximum size of five to six inches diameter. Leaving the number eight crusher the ore passes through a revolving screen 48 inches by 12 feet with 1-4 inch perforations, the rejections going direct to the foot of the elevator pit, and the balance to a No. 5 Austin gyratory crusher discharging into a 14-inch by 30-inch buckets of a fifty-two foot centre belt elevator, which elevates the ore into the loading bins, whence it discharges through hoppers into the railroad cars.

A 16-inch by 42-inch Jenckes Corliss engine, to drive the crushing plant, and two 150 h.p. return tubular

boilers, constitute the present power plant, the machine drills having been operated by steam up to the present time.

Very little systematic exploration work has been done upon the Moose Mountain Range as yet, and when it is remembered that upon all of the older ranges of the Lake Superior country millions of dollars have been, and are still being, spent in the systematic search for new ore bodies—and that all these iron ranges show more ore in sight to-day than they ever did—it seems a reasonable possibility that careful explorations in the future will reveal still other bodies of high grade merchantable ore in the Moose Mountain District.

THE IRON ORES OF ONTARIO.*

BY A. B. WILLMOTT, Sault Ste. Marie, Ont.

(Ottawa Meeting, 1908.)

This article, like many of its predecessors, must be a record of what we are going to do in the development of the iron ore resources of Ontario, rather than of what we have accomplished. It will be a statement of the opportunities open for the iron-ore miner, rather than a statement of results attained. The production of iron ore in Ontario has been as follows:—

| | Tons. | Value. |
|-----------------|------------|--------------|
| 1869-1896 | 582,542 | \$1,445,225 |
| 1897 | 2,770 | 4,996 |
| 1898 | 27,409 | 48,875 |
| 1899 | 16,911 | 30,951 |
| 1900 | 90,302 | 111,805 |
| 1901 | 273,538 | 174,428 |
| 1902 | 359,288 | 518,445 |
| 1903 | 208,154 | 450,099 |
| 1904 | 53,253 | 108,068 |
| 1905 | 211,597 | 227,909 |
| 1906 | 128,049 | 301,032 |
| 1907 | 160,000? | 350,000? |
| | 2,113,813? | \$3,771,835? |

CHARACTER OF ORES.

HEMATITE.—We have in Ontario all the usual varieties of merchantable iron ore. Of the total production by far the larger amount, namely, about one and a half million tons has been of hematite ore. So far as this has come from the Helen mine there has been mixed with the pure hematite a certain amount of limonite and goethite, which would make the product of that mine strictly classed as brown hematite. An average analysis of 20,000 tons of the earliest shipments from the Helen, runs as follows:—

| | Per cent. |
|---------------------------------|-----------|
| Moisture at 212 degrees F. | 6.610 |
| Iron | 58. 70 |
| Silica | 5.660 |
| Alumina | 0.730 |
| Lime (CaO) | 0.210 |
| Magnesia (MgO) | trace |
| Phosphorus | 0.114 |
| Sulphur | 0.047 |
| Organic matter & combined water | 9.670 |
| Insoluble | 6.040 |

The average cargo analysis for 1901 was 58.709 per cent. iron, and for 1907 just a shade better, showing that this property has maintained its grade as depth has been attained. Ores similar to the Helen have been discovered and explored at several other points, as Steep Rock, Frances, and Josephine, but as yet there has been no production. From a number of properties in Eastern Ontario, of which the Wallbridge, Dalhousie and McNab are the chief, about 150,000 tons of hematite have been produced. These ores have been good in their iron, phosphorous and sulphur contents, and carried small percentages of lime which was an additional advantage. All these eastern deposits have so far proved small, and there is reason for believing that some of them, if not all, are oxidized portions of iron pyrites beds lying below. From the Stobie mine, in Aberdeen township, a few small cargoes of specular hematite of good quality were shipped some years ago. Similar specular hematites occur in the quartzites of the Lower Huronian, at a number of points, as at Killarney, Algoma Mills, and around Echo Lake. In Aberdeen township a vein of high grade hematite occurs at the contact of a quartzite and slate conglomerate, and has been traced by pits at intervals for over a mile.

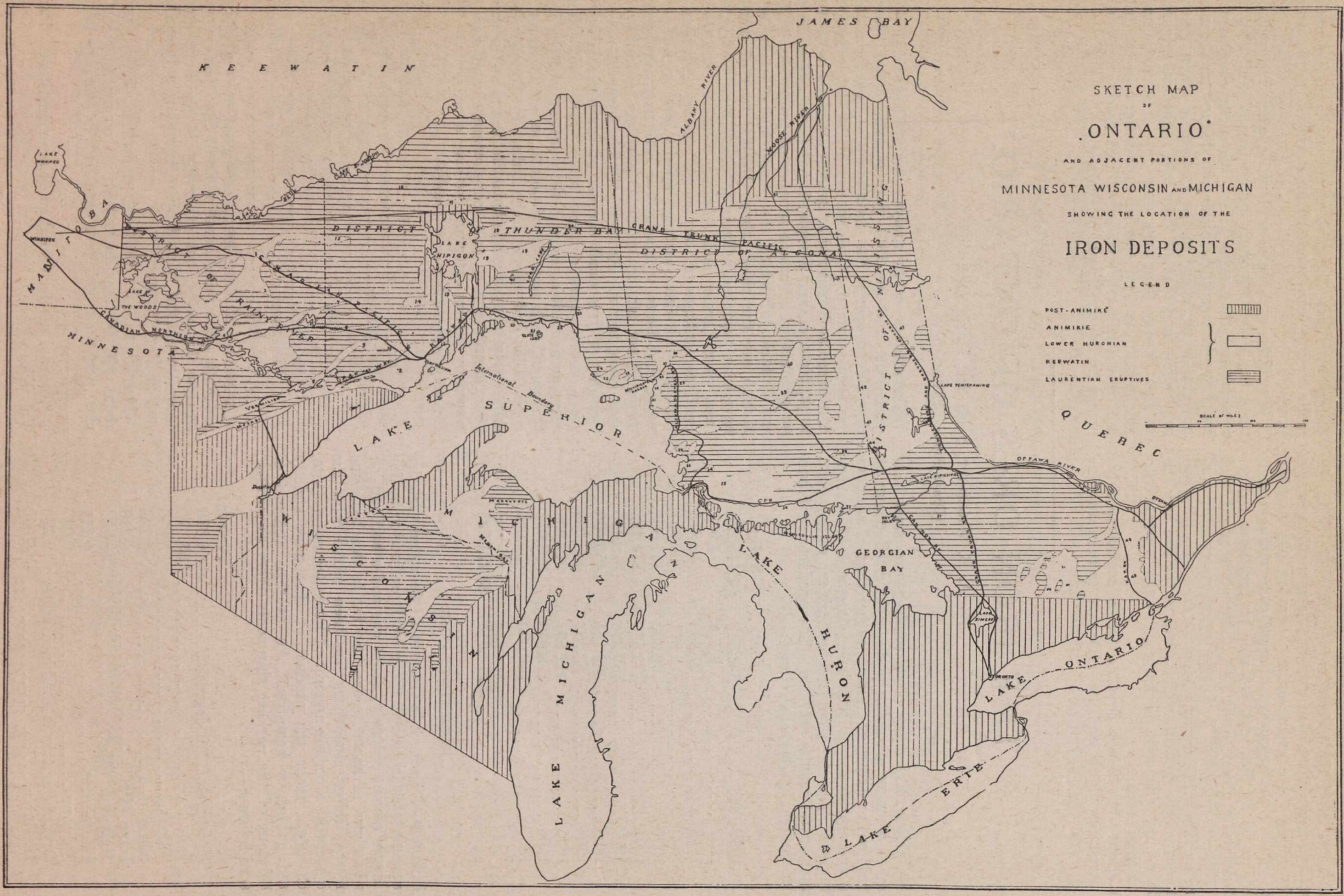
Analysis shows as, as follows:—

| | Per cent. |
|------------------|-----------|
| Iron | 65. 60 |
| Manganese | . 10 |
| Silica | 1. 73 |
| Alumina | 1. 31 |
| Lime | . 39 |
| Magnesia | trace |
| Phosphorus | 0.045 |
| Sulphur | .005 |

A somewhat slaty hematite occurs on the Williams property a few miles north of Sault Ste. Marie, Ont. A silicious hematite, but otherwise of excellent quality, occurs in the flat lying Upper Huronian, at Loon Lake, east of Port Arthur.

MAGNETITE.—Of the total production of the province about 600,000 tons have been of magnetite. For the most part these ores have been high in iron, low in phos-

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SKETCH MAP
OF
ONTARIO
AND ADJACENT PORTIONS OF
MINNESOTA WISCONSIN AND MICHIGAN
SHOWING THE LOCATION OF THE
IRON DEPOSITS

LEGEND

- POST-ANIMIKIE
- ANIMIKIE
- LOWER HURONIAN
- KEEWATIN
- LAURENTIAN ERUPTIVES

SCALE OF MILES

phorus, high in sulphur, and with titanium absent. The average of ten samples of Belmont ore taken by Prof. Miller, runs:—

| | Per cent. |
|------------------|-----------|
| Iron | 60.02 |
| Phosphorus | .015 |

A shipment of 800 tons from the same mine averaged:—

| | Per cent. |
|------------------|-----------|
| Iron | 57.38 |
| Phosphorus | .01 |
| Sulphur | .08 |

A shipment of 8,514 tons of Farnum ore ran, iron, 54.05; phosphorus, .018 and sulphur, .059; titanium, nil. A pile of 7,000 tons of ore from the Wilbur Mine averaged 57 per cent. iron, and under .01 phosphorus. Thirty-seven determinations for phosphorus made by Ingall on magnetites from the vicinity of the Kingston and Pembroke Railway ran from a trace to .17, averaging .022.

From the northern part of the province magnetites have been mined this past year, and will be shipped in an increasing amount next year. Atikokan ore from mining locations E. 10 and 11, has been smelted this season in the furnace of the Atikokan Iron Company, at Port Arthur. Surface samples from this property run, iron, 66.5; silica, 3.2; phosphorus, .015 and sulphur, .01, according to sampling and analysis by Hille¹. An average of seven samples of the best ore from a number of diamond drill cores is given by Hille, as iron, 59.3; phosphorus, .069; sulphur, 1.09, and this probably fairly represents the ore when below the zone of oxidation. The ore is being roasted by blast furnace gas before being smelted, and is giving excellent results in the manufacture of foundry pig.

A property a short distance to the west has been explored this past year by the United States Steel Corporation, and purchased by them. Surface samples show magnetite running from 53 per cent. to 67 per cent. in iron, .007 to .058 in phosphorus, and .07 to .5 in sulphur.

Another property which will this year begin shipping magnetite is the Moose Mountain, lying north of Sudbury, of which the guaranteed analysis is, iron, 55.0; phosphorus, .10; and sulphur, .011.

TITANIFEROUS MAGNETITE.—There are throughout Ontario a number of considerable ore bodies of titaniferous magnetite, such as the old Chaffey mine, and the Matthews mine, on the Rideau Canal, from which several thousand tons were shipped years ago. Near Gooderham, Ont., is a similar deposit, in connection with a large gabbro intrusive. Near Chappleau, Ont., a magnetite deposit carries 10 per cent. titanium. The Orton mine in Hastings county, an undeveloped prospect, carries from 1 per cent. to 3 per cent. titanium. In twenty-five samples of magnetites taken by Ingalls along the Kingston and Pembroke Railway, titanium was absent in 13, and 12 went between 1.03 per cent. and 16.45 per cent. Numerous other occurrences are known, but in practically every case titanium is absent from the magnetites and hematites of Ontario, except where the deposit is connected with basic eruptives.

LIMONITE.—Bog ore occurs at many points throughout the province, as deposits resulting from the leaching of the glacial drift. There are also numerous deposits

resulting from the weathering of iron pyrites, and some from the weathering of iron carbonate.

Back as far as 1813 small quantities of bog ore from Norfolk county were smelted in a small furnace at Normandale. In more recent years bog ores from Oxford county and vicinity have been smelted in small quantity at Hamilton. As already mentioned a percentage of limonite is mixed with the Helen ore, which has been classed as a hematite. Bog ores resulting from the oxidation of pyrites occur at Paint Lake in western Michipicoten, Goudreau Lake, near Missanabie, and in the vicinity of the Josephine. Similar ore is seen near some pyrites deposits near Steep Rock Lake, and also in Parkin township, north of Sudbury. Eleven cars of limonite, from what afterwards became the Bannockburn Pyrites mine, were smelted at Hamilton. The better class of such ores run from 50 per cent. to 55 per cent. in iron, and under .5 per cent. in sulphur. On the Mattagami River, there is a limonite deposit resulting from the oxidation of iron carbonate occurring in the Devonian limestone. This ore runs from 48 per cent. to 57 per cent. in iron, about .1 in sulphur, and from .1 to .2 per cent. in phosphorus. Smilar ore is found at a number of points in the valley of the Moose River, and its branches, originating in a similar way.

SIDERITE.—In connection with a number of hematite deposits in Ontario, quantities of siderite are found, which may yet become of commercial value. On the hill back of the Helen mine, there are exposed siderite lenses aggregating a width of 136 feet, and averaging 34.94 per cent. in iron, and 7.7 per cent. insoluble. A picked specimen yielded:—

| | Per cent. |
|-----------------------------|-----------|
| Insoluble | 4.38 |
| Carbonate of iron | 78.57 |
| Carbonate of lime | 4.09 |
| Carbonate of magnesia | 12.84 |
| Alumina | trace |
| <hr/> | |
| Total | 99.88 |
| Metallic iron | 37.71 |

Ore of this character in considerable amount is found at the Josephine, at Steep Rock Lake, and at other points throughout the province. It is almost always contaminated with sulphur up to 1 per cent. or 2 per cent., and but for this might be considered a fair ore of iron. It is low in phosphorus, and on roasting would yield a product running 50 per cent. in iron, and the roasting would eliminate the sulphur. The magnesia and lime present would serve as useful fluxes.

In the vicinity of Port Arthur in the Animikie formation are considerable bands of siderite, somewhat lower in iron content, and correspondingly higher in silica. The bands correspond to the taconite of the Mesabi range, though they are higher in carbonate of iron. One deposit north of Port Arthur is said to be 500 feet long by 100 feet wide, by 12 feet deep, and to average 33 per cent. iron. On the Opazitika River, and on other tributaries of the Moose, iron bearing limestones are found. These carbonates are probably too low in iron ever to be of direct value as an iron ore; possibly, however, bodies of hematite may yet be found in their vicinity.²

MAGNETIC SANDS.—At many points in the province iron sands are being, or have been, concentrated by the waters of the Great Lakes. Such a deposit is found in the vicinity of Peninsula Harbor, on the north shore

of Lake Superior. On the north shore of Lake Erie a small amount of such sands was smelted in the furnace at Normandale nearly 100 years ago. It is improbable that these sands can be made of commercial value at the present time.

GEOLOGICAL CLASSIFICATION OF ORES.

The geological formations occurring in Ontario, beginning at the most recent, are as follows:—

| | |
|--------------|----------------------------|
| Cenozoic | Pleistocene |
| | Devonian |
| Paleozoic | Upper Silurian |
| | Lower Silurian |
| | Cambrian |
| | Keweenaw or Nipigon |
| | Animikie or Upper Huronian |
| Pre-Cambrian | Middle Huronian |
| or | Lower Huronian |
| Archean | (Laurentian Eruptives) |
| | Keewatin |

In this classification the recommendations of the International Committee on the succession in Lake Superior region have been followed.³ The Laurentian granites, etc., which used to be considered the base of the geological column are now recognized as eruptives, always later than the Keewatin, and very frequently later than the Middle Huronian. In the Eastern section of the province, the International Committee recommended the following succession from below, Laurentian, Grenville, but Miller has shown (bur. of Mines, Vol. 16, page 221) that rocks undoubtedly Keewatin occur in that section of the province, and that the Grenville is really an upper portion of the Keewatin. Miller further finds an overlying formation carrying pebbles of the Grenville, which he considers Huronian. His classification corresponds closely with that adopted for the Lake Superior region, and permits an orderly arrangement of many facts, which did not fit with the previous classification.

In the Pleistocene we have the insignificant deposits of bog iron. In the Devonian there are some siderite deposits now altering to limonite in the valley of the Moose River, which are as yet unknown, and so far of no commercial value. The Clinton formation of the Upper Silurian is in Ontario, commercially barren, although a small deposit has been found near Cabot Head. The base of the Medina of the Upper Silurian is marked by red ochreous clays, which are, however, of no value. At the base of the Potsdam of the Cambrian, there are some deposits of impure hematite, such as that at Dog Lake, north of Kingston. At the base of the Keweenaw again, there are some ochreous clays, which in places almost approach iron ores, but are so far of no commercial value. In the Animikie there are possibilities of commercial ores. This formation is the one which on the United States side of Lake Superior carries the Mesabi, Gogebic and Menominee iron range. It is found in Ontario in the triangular area between the Port Arthur, Duluth and Western Railway, Lake Superior and the American boundary. At numerous points in this area indications of ore have been found, and large ore bodies have been developed at Loon Lake. In the vicinity of Sudbury is another Animikie area, but so far as known carrying no iron deposits. Except these two areas, and a few other very small areas the

Animikie is unknown in Ontario. North of the province on the eastern shores of James Bay, rocks apparently of the Animikie series are found on the Nastapoka Islands. Here very considerable bodies of iron ore have been found, and when transportation difficulties are removed these ores will undoubtedly come on the market.

The Lower Huronian formation is widely distributed throughout Ontario, the typical region being that north of Lake Huron. It should be noted that all the older geological maps and reports by Canadian Geologists, use the term Upper Huronian for what is now called Lower Huronian, and similarly Lower Huronian was used in the older reports for what is now termed Keewatin. On the accompanying map the areas of Keewatin and Lower Huronian are outlined with as great accuracy as our present knowledge of the unsettled regions of Ontario will permit. It has not proved possible to show them separately on a small scale map even when the information was at hand to do so. So far little iron ore of commercial value has been found in the Lower Huronian areas. In Deroche township north of Sault Ste. Marie, some prospecting has been done with fair results. In Long and Rutherford townships, deposits of specular hematite have been found in small quantities. In Aberdeen township a more promising prospect occurs. All of these deposits are associated with quartzite or slate. The banded jasper and hematite of the Marquette range is for the most part absent in the typical Lower Huronian area. In Harrow township the typical iron formation does, however, occur in the Lower Huronian, and at two other points iron carbonate has been found.

In the Keewatin the most promising iron deposits of Ontario are found. This formation is very widely distributed and in practically every place where Keewatin or Huronian are marked on the various geological maps, bands of sedimentary iron formation can be found. These may be small in extent, representing only the last remnants of a large area, or they may be long and narrow belts. Usually the bands are only a few hundred feet wide; almost always less than half a mile. Most frequently there are a series of lenses ranged in a row or occasionally in a few parallel rows. At times the iron belt extends for many miles enclosed on either side by green schists. The Nipigon-Long Lake belt is almost continuous for 70 miles.

The ores associated with the basic intrusives may occur in different periods, but seem to be all pre-Cambrian.

The iron ranges on the American side of Lake Superior show a close similarity geologically to those in Ontario. As seen on the map the various producing ranges occur in Keewatin, Huronian and Animikie series of the Archean. These formations occur as narrow belts between the eruptive granites, just as in Ontario. The characteristic association of banded jasper with ore is true on both sides of the lake. In the following table the total production of the different ranges is given.

| Range. | Year opened. | Total tons. | Shipments per cent. |
|-----------------|--------------|-------------|---------------------|
| Marquette | 1885 | 84,846,280 | 22.3 |
| Menominee | 1877 | 63,806,652 | 16.7 |
| Gogebic | 1884 | 54,023,478 | 14.2 |
| Vermilion | 1884 | 26,785,950 | 7.0 |
| Mesabi | 1892 | 150,198,054 | 39.4 |
| Ontario | 1900 | 1,361,000? | .4 |
| | | <hr/> | <hr/> |
| | | 381,024,414 | 100.0 |

The Ontario production is made up mainly of shipments from the Helen mine on the Michipicoten range, and the McKellar property on the Atikokan. Both of these properties are in the Keewatin formation, as also are the mines in the Vermilion. The mines of the Menominee, Gogebic and Mesabi are all in the Animikie, and most of the Marquette production comes from the Lower Huronian, although a portion of it is at the base of the Animikie, practically at the contact with the Lower Huronian. Assuming that the whole of the Marquette production is from the Lower Huronian, one finds that of the total production of iron ore from around Lake Superior, 70.3 per cent. has been produced from the Animikie, 22.3 from the Lower Huronian, and 7.4 from the Keewatin.

COMPARISON WITH SCANDINAVIAN ORES.

In the transactions of the American Institute, 1907, a classification of the Scandinavian Iron Ores is given by Prof. Sjorgen. Considering the similarity between the general geological conditions of Scandinavia and northern Ontario, a comparison is of interest.

1. Ores of the Archean Crystalline Schists.
 - A. Apatite Ores.
 - B. Mixed Hematite and Magnetite.
 - C. Quartz Banded Ores.
 - D. Skarn Ores.
 - E. Limestone Ores.
2. Ores of the Porphyries.
3. Magmatic Segregations in Basic Eruptives.
4. Iron Ores of Metamorphosed Cambro-Silurian Schists.
5. Contact Deposits in the Christiana Region.
6. Lake and Bog Ores.

Of these groups numbers 2, 4 and 5 are not found in Ontario. While eruptive porphyries occur, so far we have no iron ores associated with them. In Ontario there are no metamorphosed Cambro-Silurian Schists, nor eruptives of the post-Silurian age, so that groups 4 and 5 are impossible. The other groups 1, 3 and 6 are found in Ontario, and closely resemble the corresponding deposits in Scandinavia. The Apatite ores of group 1, resemble closely the ore mined in the Lake Champlain region of New York State, which again is closely paralleled by some deposits in eastern Ontario. The mixed hematite and magnetite deposits free from banded material are not common in Ontario, but the deposit north of Cartier would seem to resemble corresponding deposits in Scandinavia. The quartz banded ores are extremely common in Ontario, more so than in Scandinavia. Typical occurrences are those of the Mattawin, Michipicoten and Temagami ranges. The Skarn ores and Limestone ores of group D. and E. can be paralleled from some of the minor deposits in eastern Ontario. Magmatic segregations in basic eruptive rocks, group 3, are very common in Ontario, and titaniferous as in Scandinavia. The lake and bog ores of the two countries are naturally similar.

GENESIS OF IRON ORES.

As previously stated the majority of the Ontario ores occur in the Keewatin formation. At the base of this series is a mass of greenstone frequently ellipsoidally parted, which is the oldest known rock of the Lake Superior area. Overlying this are various green schists, and towards the top of the series the iron formation proper.

This consists of ferruginous cherts more or less banded with hematite and magnetite, iron carbonate and iron pyrites. Carbonated schists frequently border the iron formation. Originally these belts seem to have been a chemical sediment, but are now found in nearly every case closely folded, and standing nearly vertical. Transverse folding has been a very common occurrence, and the anticlines have been frequently eroded until the formation has been cut off into separate lenses, varying from a few feet to a few miles in length. In most cases the width of the formation is a few hundred feet, and occasionally up to half a mile. Folded with the iron formation there is usually a bed of green schists which forms an impervious layer at the bottom of the basin. The American geologists who have closely studied the Vermilion and other south shore ranges are of the opinion that the ores associated with these ranges have resulted from descending water concentrating the leaner ores from above, in the bottoms of these basins. Iron carbonate is supposed to have been the most frequent source of the ore, but both iron silicate and iron pyrites have also contributed. Probably in our Ontario ranges iron pyrites is a larger contributor than in the ranges to the south, as it occurs much more frequently in the ranges to the north of Superior than to the south. In some few cases the original deposits in connection with the formation seems to have been rich enough to make an iron ore without further concentration. In other cases there are lean silicious magnetites up to 40 and 45 per cent., which can hardly be classed as commercial ore bodies, and which might well represent original deposits without secondary concentration. In these the silicious bands are absent, the silica being more evenly distributed through the whole mass. Another class of ore bodies includes those which are regularly banded, consisting of either hematite or magnetite, alternating in narrow bands from 1-8 inch to 2 inches in width, with bands of quartz, which may be white chert, or red or black jasper. It is with the more granular cherts that the hematite ore bodies so far discovered have been found.

SPECIAL DESCRIPTIONS.

An attempt has been made to show on the map the principal areas in which iron ores have been found, and to add here a very brief description concerning them. It is probable that in every area shown on the map as containing Keewatin rocks, the iron formation will be found when search is made. In the following descriptions the numbers after the names refer to the corresponding numbers on the map.

The Dryden and Wabigoon area (1) shows a number of bands of lean silicious magnetite with assays running in the vicinity of 40 per cent. iron. Kaiarskons Lake deposits (2) of silicious magnetite with some higher grade lenses have been slightly explored. Parallel to it is a belt of iron pyrite characteristic of the Keewatin ranges. At Bending Lake (3) a number of locations have been taken up on a silicious magnetite somewhat similar to the two previous ones. In Watten and Halkirk townships on Rainy Lake (4) a band of the iron formation has been found, containing magnetite and particularly rich in sulphides. It is traceable at intervals for some miles either way, and is really part of one belt extending from Fort Frances up the valleys of the Seine and Atikokan as far as Magnetic Lake, a distance of slightly over 100 miles. At Steep Rock Lake (5) the formation has been considerably bent. Diamond drilling on the eastern arm

of Steep Rock Lake, and also on Strawhat Lake has disclosed fair bodies of hematite ore. In these cases, as in several others in Ontario, bodies of iron pyrites are found in close contact with, but not contaminating, the hematite ore. Considerable bodies of siderite also occur. Through the valley of the Atikokan (6) are a number of deposits of magnetite standing out as low hills in the valley, and accompanied by various green schists. These magnetites are low in phosphorus, but high in sulphur. The deposit of McKellar's is now being worked by the Atikokan Furnace Company, and a property a short distance west of this, after careful exploration, has been bought the past year by the United States Steel Corporation. On Fire Steel River (7) bands of pyrites are known, which represent the iron formation in that belt of Keewatin. On Hunters Island (8) there are several parallel belts of the iron formation which may represent a folding of the Keewatin, but possibly as suggested by Leith some of the belts are Huronian. The Hunters Island range is in line with the Vermilion, and distant from the closest part of it about 20 miles. There has been little exploration beyond surface work, but it is reported that the little drilling done was fairly successful. At Greenwater Lake (9) is a continuation of the Vermilion-Hunters Island belt, and this continues to the east through the Mattawin area (10) and Conne and Ware townships (11). These last three occurrences are all similar in character, showing banded jaspers with magnetite and hematite. Picked samples from the surface of locations on the Mattawin, yielded 58 per cent. to 68 per cent., iron, .013 to .056; phosphorus, .054 to .164; sulphur and titanium, nil. The amount of ore in this belt is very considerable, but so far the limited exploration which has been done has not revealed any large concentrations. The ore is favorably situated for transportation, and could be quarried from hillsides. Until, however, the higher grade ores are mined out, it is questionable whether these surface deposits running 40 per cent. in iron can be economically concentrated. There is, however, a probability that bodies naturally concentrated may be found, if properly sought. The Anikie formation (12) occupies a considerable area round Lake Superior, and at many points within it carbonate of iron, running 20 per cent. to 25 per cent. is found.

At Loon Lake and vicinity, 25 miles east of Port Arthur, considerable exploration work has been done, resulting in the finding of several beds of excellent hematite ore, narrow, however, in width, and separated from each other by lean material. This ore where pure is high in iron and low in phosphorus and sulphur, and carrying a little lime, is altogether an excellent furnace ore. The costs of mining and concentration are, however, problematical, and no company has yet attempted to operate commercially. Altogether there is a big tonnage of ore which will undoubtedly be valuable before long. It is only four miles from Lake Superior, and is traversed by the main line of the Canadian Pacific Railway. A second series of beds lie above those already mentioned, which contain even larger quantities of iron. This is, however, only about 35 per cent. ore, and high in phosphorus and sulphur. On Black Sturgeon River (13) are some deposits of hematite in the Keewatin of a promising character. At Little Pike Lake (14) specular hematite interbanded with a gray slate occurs on a number of locations taken up some years ago, but on which no work has been done. At Savant Lake (15) the usual iron range rocks of the Keewatin occur, and search may result in the finding of merchantable ore. On Whitearth Lake (16) iron range rocks are reported.

At Cariboo Lake (17) lean silicious magnetite is found over a large area, also at Mud River, somewhat to the east. In the valley of the Red Paint (18) the Keewatin formation is traceable for some miles, and some diamond drilling was in progress last year. The Nipigon-Long Lake (19) belt is 70 miles long and almost continuous. At the Nipigon end three parallel belts are found, the centre hematite, and the north and south magnetite. A little drilling has been done but not enough to determine definitely. At Little Pine Lake (20) a similar formation occurs, and also on the Slate Islands (21). On Lake Superior at the mouth of the Little Pic (22), locations were taken up years ago for a magnetite associated with a basic eruptive. The ore is lean and probably useless. Ten miles up the Pic River (23) are some magnetite locations showing iron ore carrying about 45 per cent. and contaminated with a little sulphur. At Otter Cove (24), in a small fragment of the Keewatin, a lean magnetite occurs. At many points throughout the Keewatin belt of the western part of Michipicoten (25) the usual iron range rocks are found. Towards Lake Superior these occurrences are silicious magnetites; further north they are banded cherts with hematite and magnetite. At the Frances diamond drilling has shown towards the bottom of one of these basins, considerable hematite of good quality. In central Michipicoten we have characteristic banded cherts and hematite at a number of points. At the Helen Mine (26) is the largest ore body yet exploited in the province, which has yielded about one and a third million tons of ore to the end of 1907. Associated with this ore, as is so often the case, are deposits of pure pyrites. At the Josephine (27) drilling has shown considerable ore, under the waters of Parks Lake. The iron range is traceable both east and west from the lake, and theory indicated that where the iron-bearing rocks had been broken down and eroded so as to form a lake basin, a deposit of ore might be sought, and this was done successfully. Further to the north (28) the range is so rich in sulphur that it has become of value as a source of iron pyrites, iron oxide except as a gossan being practically absent. At Michipicoten south, lean magnetites are found at several points as at Anjigomi (29) and Bridget Lake (30). At Cape Choye (31) and eastward, an unimportant belt of Keewatin occurs, carrying lean hematite and magnetite. At Batchawana (32) banded jasper and hematite occur a few miles from Lake Superior, and six miles further back several deposits of lean magnetite. At Goulais Bay (33) a belt of the Keewatin formation runs east and west for several miles, and is enclosed by rocks of the Lower Huronian. The brilliant jasper conglomerates which occupy miles of the Lower Huronian have always proved extremely interesting, and until the discovery of this Goulais belt no source of the jasper pebbles was apparent. The probability is that this is only a small part of one of several buried ranges. In Deroche and adjoining townships there are several occurrences of hematite associated with quartzite and slate. Some of these lenses are good ore, but no large bodies have yet been found, though further development is warranted. From Aberdeen township (35) several small vessel-loads of good hematite were shipped years ago. In the northern part of the township a promising prospect of hematite is being developed, which occurs at the contact of the slate and quartzite. In the townships of Long (36) and Rutherford (37) occurrences of high grade specular hematite in the quartzite have been explored, but the deposits have proved small. North of Cartier (38) a deposit of hematite and magnetite is of considerable

promise. At Woman River (39) and north of Flying Post (40) belts of banded jasper and hematite are found continuous for some distance, and of considerable width. At the Grand Falls on the Mattagami (41) carbonate of iron and the resulting limonite are found. Further exploration of these and similar deposits occurring in the Devonian may show ores of value as soon as transportation has been provided. At Shining Tree Lake (42) and Burwash Lake (43) the usual banded ores are found. At Moose Mountain (44) is a large deposit of magnetite, which seems to be an original deposit, and not a secondary concentration from the usual leaner ores. This property is now connected with the Georgian Bay at Key Inlet by railway, and shipments will begin on a large scale next season. To the north and west banded iron continues, and is found on the Wahnapiatae (45) to the southeast. Around Temagami Lake (46) are several belts of the usual iron range rocks making altogether a good many miles in length. On the Caldwell-Mulock property a little diamond drilling has been done, but with this exception these ranges are as yet unexplored. In Boston township (47) lean magnetite has been found, and a little exploration work has so far failed to locate commercial ore bodies. At Lake Abitibi (48) the usual iron range rocks occur. Along the Kingston and Pembroke Railway in Eastern Ontario are numerous deposits of magnetite which have been worked in a small way in years gone by.

Similar occurrences are found in Hastings and adjoining counties (50). In both these districts the magnetites are fairly high in iron, low in phosphorus, and apt to be contaminated with sulphur. In the Parry Sound district (51) there are several occurrences of magnetite, associated with limestone. This area has not yet been mapped, so that an outline of the Keewatin and Huronian cannot be given.

CONCLUSIONS.

There is no other area in the world equal to the Lake Superior region as a producer of high grade iron ore. The only competitor is the Minette region of Germany, France and Belgium, which is being rapidly left behind. The following table shows the great increase in production which has yearly taken place on the American side of Lake Superior:

Production of Iron Ore from Lake Superior.

| | Long tons. |
|------|------------|
| 1891 | 7,621,465 |
| 1892 | 9,564,388 |
| 1893 | 6,954,620 |
| 1894 | 7,682,548 |
| 1895 | 10,268,978 |
| 1896 | 10,566,359 |
| 1897 | 12,205,522 |
| 1898 | 13,779,308 |
| 1899 | 17,802,955 |
| 1900 | 19,121,393 |
| 1901 | 20,593,537 |
| 1902 | 27,571,121 |
| 1903 | 24,281,575 |
| 1904 | 21,726,590 |
| 1905 | 34,241,598 |
| 1906 | 38,393,495 |
| 1907 | 41,817,385 |

But even the immense resources of the American side of Lake Superior will reach an end. The serious drain on this supply is well known in the following quotation

from Van Hise, one of the best authorities on Lake Superior iron mines.

"The total produce of the Lake Superior region since mining began in 1850 to 1899, inclusive, is 171,418,984 long tons. The amount mined in the decade between 1891 and 1900 inclusive is 114,017,546 long tons, or 66.5 per cent. or nearly seven-tenths of the total amount mined. The product for the year 1900 surpasses that of any previous year, and is one-ninth of the aggregate of this and all preceding years. It is certain that the product of the current decade will far surpass that of the last decade."

It is most striking that the production for 1907 is also one-ninth of the aggregate of this and all preceding years.

This season as a result of the investigation by the Tax Commission of Minnesota, it has been determined that the Minnesota deposits of ore approximate 1,170,000,000 tons. The total tonnage for the Lake Superior district of the United States, including undeveloped lands, amounts to 2,000,000,000. This, on the basis of last year's consumption, will last fifty years, but as is shown in the preceding table, consumption is advancing with rapid bounds. Already lower grade ores are being marketed than a few years ago was thought possible. In 1907 the standard for iron ore was reduced from 56.7 to 55, and this will undoubtedly continue as iron ore becomes scarcer. Moreover, three-quarters of the ore reserves of Minnesota are in the hands of one company. As the scarcity develops on the southern side, the search for ore among the iron formations in Ontario must correspondingly increase. As shown on the map the same geological formations are found throughout Northern Ontario as in Minnesota, Wisconsin and Michigan. One mine in Ontario has already produced one and a third million tons of ore, and two other properties have begun shipment. It will be extremely strange if the banded jasper and hematites found for so many hundred miles throughout Northern Ontario are not in places associated with iron ore, as they are on the south side of Lake Superior. When these surface indications on the Canadian side are followed up as they have been on the United States side, similar ore bodies will undoubtedly be found. The amount spent on exploration on the Vermilion range alone, between Tower and Section 30, a distance of say thirty miles, probably surpasses all the money spent in actual exploration of the hundreds of miles of similar ranges in Northern Ontario. Not only must part of the future demands of the United States be met from Ontario, but the Ontario demand itself must also be provided for. As shown in the accompanying table we only furnished last year per cent. of the ore required for our Ontario furnaces. Indeed from 1901 and onward the per cent. of Ontario ore used in our furnaces has steadily decreased.

Consumption of Iron Ore in Ontario.

| | 1901 | 1902 | 1903 | 1904 | 1905 | 1906 | 1907 | |
|-------------------------|---------|---------|---------|---------|---------|---------|---------|------|
| Ont. ore smelted.. | 109,109 | 92,883 | 48,092 | 50,423 | 61,960 | 101,569 | | |
| For. ore smelted.. | 85,401 | 94,079 | 103,137 | 173,182 | 383,459 | 396,463 | | |
| Ratio Ont. ore to total | 56 p.c. | 50 p.c. | 32 p.c. | 23 p.c. | 14 p.c. | 20 p.c. | | |
| Pig made | | | | | | | 275,558 | |

As stated in the beginning of this paper the record of the production of iron ores in Ontario is rather one of opportunity than of achievement.

It has been suggested by several competent geologists that the only reason that can be suggested why the iron

formations of Ontario should not overlie ore bodies as they do south of the international line would be the greater glacial erosion to the north. This reason does not appeal to me so forcibly as to some. It is generally accepted that the iron ore bodies of Lake Superior have been concentrated in underlying impervious basins by descending waters. The upper portions of the formations are left that much poorer, and it is these that have for the most part suffered erosion. In the "old ranges" of the south shore ore is being mined to a depth of 2,000 feet, and little of it came from near the surface. Even if it be granted that glacial erosion was carried deeper in Ontario (and this might be successfully disputed) unless it cut nearly to the bottoms of the basins the ore deposits would be only slightly affected. Severe erosion of this kind would have left only shallow and isolated patches of the iron formations instead of the hundreds of miles which are found in Ontario. Moreover, drilling has already established at several points that the formation is at least 500 to 1,000 feet deep. These considerations do not apply to the flat lying Animikie, where a few hundred feet of erosion would cut to the bottom of the basins.

To my mind the most striking differences between the United States and Canadian occurrences are (1) the relative greater abundance of the Keewatin iron formation in Ontario as compared with those of Lower Huronian and Animikie age, and (2) the more frequent occurrence in Ontario of iron pyrite with the ferruginous cherts, etc., of the iron ranges. Apparently iron pyrites and iron carbonate were somewhat equally deposited in the iron formations of Keewatin times, and iron carbonate predominated in Lower Huronian and Animikie times.

REFERENCES.

- ¹ Jour. Can. Min. Inst. 9-1906).
- ² Bur. of Mines, Vol. 13, pages 150-152).
- ³ Journal of Geology, 1905, or Bur. of Mines, Vol. 14, page 269.

PERSONAL AND GENERAL.

Mr. M. J. O'Brien, of the O'Brien Mine, Cobalt, returned early in March from Mexico and Arizona.

Mr. Floyd Harman, late manager of the Temiskaming Mining Company of Cobalt, has gone to Nevada to take charge of a mine.

Mr. J. Williamson has purchased on behalf of a New York syndicate two gold mining claims situated between Keewatin and Osterund for \$24,000.

President Anthony Blum, of the Imperial Gold Mines Company (late Laurentian), Manitou Lake, has returned East after a visit to the property.

Mr. John A. McVicar, manager of the Ontario Government diamond drill, is in Port Arthur for the purpose of testing mineral properties in that district.

Mr. John Moen, a mining man of Nelson, B.C., has returned to British Columbia after a lengthened inspection of the Cobalt, Sudbury and other Ontario mining fields.

Mr. W. R. Birdwood, of Edmonton, Alta., has gone to England with a view of interesting British capitalists in a large salt deposit recently discovered near Fort McMurray.

Mr. Wm. Ogilvie, president of the Yukon Basin Gold Dredglug Company, who has been in San Francisco purchasing machinery for a new dredge, has gone to Whitehorse, Yukon, where the dredge is under construction.

Mr. C. A. Hood, of the Deister Concentrator Company, passed through Toronto on the 10th inst. on his way to Cobalt. Mr. Hood reports four No. 2 tables and two No. 3 tables in commission at the Buffalo mine, and four No. 2 at the Coniagas.

Mr. Graham Fraser, who replaces Mr. David McKeen on the directorate of the Dominion Coal Company, is one of the pioneers in the coal mining and steel industries of Cape Breton, and has been identified with the Dominion and Nova Scotia Steel Companies.

Mr. J. B. Woodworth has just returned to Toronto from the State of Sonora, Mexico, where, in the interests of a small Canadian syndicate, he has taken up an extensive gold-silver property. Mr. Woodworth has also purchased a copper property in Southern Arizona.

CORRESPONDENCE.

Kingston, Ont., March 9, 1908.

The Editor,

CANADIAN MINING JOURNAL, Toronto.

Dear Sir,—May I call attention to a change in title which has lately appeared in the publication of the Canadian Geological Survey?

The time-honored and quite necessary title has formerly been "Geological Survey of Canada." Every civilized country has a Geological Survey, and it is necessary to distinguish one from another. Geology is common to all countries, and we might as well call ourselves "the people" instead of "the people of Canada."

At the recent meetings of the Canadian Mining Institute in Ottawa a map of Rossland was shown which had the following title: "Canada, Department of Mines, Geological Survey Branch." This is surely cumbersome enough, but the title of the last summary of operations is even less explicit, for the word Canada does not appear at all. It reads: "Department of Mines, Geological Survey." Up to 1908 all the publications have the sensible title, "Geological Survey of Canada." Why should it be changed?

Mr. J. C. Drury, speaking at the 1906 meeting of the Canadian Mining Institute, said: "As one trying to earn an honest dollar out there in British Columbia, I hope Mr. Sifton will go on and establish a Department of Mines—swallow up the Geological Survey if necessary." At that time the Geological Survey was itself a Department, and a delegation from the Institute went up to Ottawa on April 18th, 1906, to meet the Premier and the Minister of the Interior, with the object of impressing upon them the necessity of conserving and confirming the powers of the parent institution, the Geological Survey of Canada.

Yours truly,

J. C. GWILLIM.

SPECIAL CORRESPONDENCE

NOVA SCOTIA.

GLACE BAY.

The present session of the Nova Scotia Local Legislature is taking up an unwonted interest in matters pertaining to coal mining, indeed an extraordinary and significant interest. Dr. Arthur Kendall, M.P.P., for Cape Breton has given notice of the following resolution:—

“That this House considers the time has arrived when the Government and people of Nova Scotia should become acquainted with all the facts, as far as they can be ascertained, relating to the coal mining industry of the province.

“That in accordance with this proposition the House resolves that a Commission, composed of members of the assembly and coal mining experts, should be appointed, whose duties should be to enquire into and report on the following matters:—

1. The extent and condition of the province's asset in coal.
2. The condition of coal mining leases.
3. The methods employed by promoters to form companies and to obtain capital.
4. The preparation of plans for new mining enterprises and extensions.
5. The methods of mining and losses of coal to the province incident to mining.
6. The prices of coal in this province and beyond the province.
7. The remuneration of miners, provision for old age, for injuries and dependents of miners.
8. The enforcement of laws intended to lessen or prevent accidents.
9. Further requirements to prevent accidents and to afford relief to victims or the dependents of victims.
10. And other matters relating to mining.”

This is a somewhat comprehensive menu, and we are left wondering what are the “other matters relating to mining” that have not been mentioned. Surely the doctor has covered the length and breadth, the depth and height, of the science of mining, the gentle art of financing, the economics and the vital statistics of the industry. The work of a Commission that would thoroughly investigate all the matters referred to in the resolution above would be “no picnic.” Perhaps, when they had finished their labors, they would produce that long called for and long expected text book, that shall tell us all there is to know about mining. Most of the matters brought up by the resolution appear, however, to have been dealt with by the Government, who have announced their intention to bring in a Government measure consolidating the Coal Mines Regulation Act. There can, of course, be no doubt that the coal mining industry of Cape Breton and Nova Scotia is of such vital importance to the Province of Nova Scotia that it merits all the attention that can be devoted to it, and the present Government appear to realize this to some extent.

There is one matter which is suggested by the eighth clause of Dr. Kendall's resolution “the enforcement of laws intended to lessen or prevent accidents,” and that is the personnel of the mines inspectorate of Nova Scotia. One of the facts that can be ascertained is that nothing will so tend to the prevention of accidents and the preservation of life and property as the existence of a vigilant and capable inspectorate. The men who compose the present force of inspectors are good men, we have no doubt, but they were not appointed by competitive examination, and we do not think that any of them are men with a college training.

The Inspector of Mines should be a man of considerable scientific attainments and extensive knowledge of modern mining meth-

ods, in addition to having a thorough grasp of practical mining and all that appertains to it. He should be a man that can advise and direct in case of emergency and danger, and a man whose advice could be sought and relied upon as proceeding out of a well trained experience added to scientific knowledge. No inspector should be appointed for political purposes, and “we consider the time has arrived” when no man should be appointed to an inspectorship, because of his political preferences or as a reward of political loyalty. He should be appointed because his qualifications mark him out as fitted for such an onerous and responsible position. To-day when mines are at work in Nova Scotia with 1,500 persons below, in one mine, at one time, whose lives may be endangered by the ignorance or the stupidity of one man, we require inspectors who can enforce regulations, and explain why they enforce them. The Government of Nova Scotia should have a Chief Inspector of Mines, whose scientific and technical attainments should be beyond reproach. This man should appoint his assistants by rigid competitive provincial examination, such as would entirely eliminate the incompetent and raise the status of the inspectorate. Men of this calibre would need and could not be obtained without the payment of adequate salaries, but in return, we would get adequate men, and it would open up an avenue of promotion for the young and ambitious mining students of the province. The Inspector of Mines should bear the same relation to the colliery manager that the colliery manager bears to his overmen, and the correspondingly more difficult than the colliery manager examination.

As conditions are now, the managers and salaried officials of the coal corporations are men whose wide range of experience and technical knowledge obtained by years of hard study, make them infinitely better able to advise the inspectors than the inspectors are to advise them, which is a reversal of the correct state of affairs. We think it will be found that most of the recent improvements in Cape Breton mining as regards safety—and they are many—have been carried out at the sole initiative of the officials of the coal corporations, who constitute the only body of mining experts in the province.

We have before pointed out in these columns that the mines of Nova Scotia produce more coal with fewer accidents than any mines in the world, and this is not altogether due to naturally safe conditions of mining. It is due to the application of modern mining methods and a consistent regard for anything that will tend to make the mines safer. These conservative methods have not been forced on the operators, who have carried them out, because they thought they were necessary, in many cases at a much increased mining cost. But we think the mine operators of Nova Scotia would welcome the appointment of inspectors of the type we have outlined, and we have yet to find them opposing anything in the nature of progress or safer conditions of mining.

The Commission that was appointed by the Nova Scotia Government to consider the present status of the colliery relief societies and the possibilities of an Old Age Pension Scheme for Nova Scotia have presented their report. The Commission cannot see their way to recommend the adoption of an Old Age Pension Schemes for all workmen in the province, for the reason that the finances of the province could not bear the strain, but they recommend old age pensions for miners, stating that “coal mining may be considered one of the extra hazardous employments not offering to the mass of the employed, much chance for advancement and from the nature of its predisposing to premature disease and consequent disability.” The Commission recommend the formation of the Nova Scotia Colliery Workers' Provident Society, which shall be an amalgamation of the existing Relief Societies. The Commission point out the many disadvantages that arise from the present independent action of the Relief Societies, as for instance, the indigence of one society and the

possible bankruptcy of another, compared with the affluence of other societies at newer and better favored collieries. The Commission make the following important comment. "Our investigations have disclosed that the medical men whose certificates are necessary before the claimants can come on the funds for sick benefits are more or less subject to claims that have no merit. None of the present societies have their own doctor, the one whose certificate is accepted being always in the employ of the claimant. Such a system, or the lack of it, can only have one result, namely, a strong tendency to waste the funds on unrighteous claims. This is a detail that might be worked out hereafter, but for the present we may suggest that in some of the mining districts there are societies, which might be grouped for the purpose of employing a medical man who would in no sense be the employee of the members. Further, the branches might employ a paid visitor for the purpose of investigating and keeping down unjust claims, after a medical certificate had been properly granted. Here the Commission have touched upon a very important point, one that we wish to allude to in considering the draft of a Workmen's Compensation Act submitted by Dr. Kendall.

The Commission suggest the formation of an Emergency Fund to be available in case of some extensive disaster. This they suggest should be formed by taking 10 per cent. of all surplus relief funds over \$1,000, in the hands of societies, a per capita tax per annum from each member of 30 cents and a special grant of \$2,000 from the Government. This fund would be permitted to grow by yearly accretion until it had reached \$50,000, after which the widows of miners killed in their work should be allowed to share in the fund. After the fund reached \$100,000, it is suggested the fund should take care of the children of miners killed, and that at that time the branch societies should be relieved of this burden.

The Commission further recommend the formation of a Pension Fund and total disability fund entirely distinct and separate from the relief fund. Contributions to these funds would be compulsory on all workmen and the employers, while the Government would contribute their quota. Further particulars can be gleaned from the report of the Commission, but enough can be said to show that they have thoroughly covered the ground and have made a sensible and comprehensive report, with recommendations of a practical character. We are convinced that no better scheme can be devised to meet the exigencies of colliery relief work, than one which distributes the onus over the royalty owner—in this case the Government—the mine operators and the mine operatives, the three classes most intimately concerned. This plan is working well in Germany, and although the recommendations of the Commission do not go so far as the elaborate organization of such a society as the German National Miners Provident Association, or the Knappschafts-Verein, yet they are in effect the same.

The Commission state they consider miners are entitled to Old Age Pensions because their occupation is extra hazardous and their work predisposes them to premature disease. We take exception to these statements. The miners are in line for Old Age Pensions, because their Relief Funds have formed the nucleus of such a fund, and Governments help those who help themselves and the Government. The work of a miner does not predispose him to premature disease. Unfortunately it is only within the past few months that the Government of Nova Scotia has awakened to the necessity of keeping vital statistics, and we cannot give any figures to prove this statement as it refers more particularly to Nova Scotia. But so far as we know the mines of Nova Scotia compare favorably with those of the country, and it is now an acknowledged fact, that miners live longer than other laboring men, longer even than the farm laborer. They work in an atmosphere that is constantly renewed and it is an accepted fact, that for some reason or other coal dust acts as preventive of tuberculosis.

The fact is that the regular work of the miner in an atmosphere that many a woman worker in a factory would gladly welcome, the antiseptic effect of the coal dust, the constant ablutions rendered necessary by his work and the short hours that he works, added to the comparative luxury in which he is enabled to live, by the high wages he receives, render the miner more or less of a favored person among workmen. In Cape Breton anyway, the "premature disease" he often suffers from, is superinduced by bad whiskey and exposure to the weather under its influence. We may say that we rather doubt the accuracy of the figures in the report that purport to record the number of old men working at the mines. At the same time any man working in Cape Breton over sixty, who has spent his life there, must either have wasted his substance or have been the victim of financial misfortune.

The month of February was exceedingly mild, and delays from weather were very slight. For days the temperature did not fall below forty degrees, and practically no snow fell during the month. The outputs of the Dominion Coal Company for the month, were in excess of any previous outputs for February, reaching the record figure of 285,000 tons. This is over 60,000 tons ahead of February outputs in 1907. The Hub output was over 6,000 tons, the largest since the fire, and the Emery mine No. 10, produced 11,364 tons. This latter mine is now averaging nearly 500 tons per day.

The Conciliation Board began their deliberations on the 2nd March, with an all day session. The chairman of the Board, Prof. Adam Shortt, is a hard worker, and is losing no time in getting at the facts. On the 3rd the Board accompanied by representatives of the men and the company's officers inspected the workings of No. 2 Colliery. They put in six hours in the mine, and afterwards renewed their conferences. If this is the way Conciliation Boards work, we should soon see results. Prof. Shortt is evidently a hustler, and he makes an excellent chairman. The local paper is very indignant that newspaper reports of the proceedings are not to be allowed, and they refer to Prof. Shortt's ruling as "Star Chamber methods." We understand it is the policy of the Government not to take evidence formally at those Conciliation Board meetings, and we think their policy is founded on good sense. Formal evidence taking necessitates the presence of a stenographer, and gives the Board meetings too much of the formal air of a court house, and does not conduce to free discussion and open language. Men are apt to unduly measure their words, when they know that some "chiel is present takkin notes" and they do not ventilate their opinions as they would were no stenographer present. Further, we do not know that the general public are interested in the proceedings of the Board. What they are interested in is the finding of the Board, and expressions of public opinion, while the case is under review do not help matters. We think Prof. Shortt is right and the "Glace Bay Gazette" is wrong.

Dr. Kendall has again introduced his Workmen's Compensation Act before the Nova Scotia local assembly. The bill is the same as submitted last year, and is in effect a copy of the British Workmen's Compensation Act, of 1897, with some definitions and amendments that subsequent litigation in England have rendered advisable to properly convey the spirit of the Bill. It is difficult to see what action the Nova Scotia Government can take on this bill, seeing that they are practically committed to an Old Age Pension Scheme and a consolidation of the Colliery Relief Funds. The two things could not exist side by side. We believe that the recommendations of the Old Age Commission are in the right direction, and promise to evolve a national society that will be of real benefit to all concerned. The Workmen's Compensation Act is not a success in England. It is pauperising the working classes, it is driving capital out of the country, it is destroying the friendly societies that were once the stay of the workers, and is recoiling upon those it

was intended to benefit. The gravest flaw in the British Compensation Act, and consequently in the proposed provincial act is its unfair distribution of responsibility. It places all the onus and all the responsibility on the employer, and gives the employee a free rein. More could be said on this matter, and we purpose returning to it. But we think Dr. Kendall's measure is put out of court by the proposals of the Government as to old age pensions and colliery relief. No colliery company could make contributions to a relief society were a Compensation Act to be put in force.

ONTARIO.

Cobalt.

A number of the Cobalt members of the Canadian Mining Institute went down to Ottawa for the meeting. On the way down they inspected the smelter at Trout Mills, near North Bay.

The following were the shippers for the month of February:—

| | Tons. |
|------------------------|--------|
| O'Brien | 257.83 |
| McKinley-Darragh | 193.20 |
| T. H. & B. | 129.00 |
| Nipissing | 127.82 |
| La Rose | 72.05 |
| Buffalo | 63.67 |
| King Edward | 61.93 |
| Trethewey | 57.54 |
| City of Cobalt | 50.00 |
| Drummond | 46.17 |
| Coniagas | 32.72 |
| Cobalt Lake | 32.45 |
| Temiskaming | 28.12 |
| Kerr Lake | 21.30 |

Making a total of 1,173 tons for the month. This is 270 tons more than for the same month last year. The total shipments from January 1st to March 1st, were 2,599 tons, being 716 tons more than for the same period of 1907.

Badger Mine.—The shaft on the No. 9 vein is now down 90 feet. The vein is nine inches in width, carrying smaltite and native silver.

City of Cobalt.—Four inches of very rich ore has been met with in the shaft at a depth of 156 feet.

Cobalt Lake.—This company has shipped a car of ore to the Anglo-French Nickel Company, at Swansea. They are paid for the cobalt contents only. The ore will go over 14 per cent. arsenic, 10 per cent. nickel and about 80 ounces silver.

Right of Way.—Drifting north, from the 150-foot level of the No. 2 shaft, has been started, to connect with No. 1 shaft. There is about 175 feet more of driving to be done to connect the two shafts at the 75-foot level.

The new vein, cut in cross cutting from the No. 1 shaft, is practically all niccolite with native silver.

Coniagas.—Two cars a month, of ore and concentrates, are being shipped regularly from this mine.

T. H. & B.—The cross cut north is now over 300 feet in length. It should cut the big cobalt vein in another 85 feet.

The ore in No. 2 level East, is looking very well. The shaft is down 130 feet.

Four cars of ore were shipped in February. The last returns gave between 47 and 48 thousand dollars for one car and four are expected to be equally rich.

Little Nipissing.—Nearly a carload of ore is ready for shipment. This is all ore taken from the new find on the ground leased from the Peterson Lake Company. It is smaltite and native silver.

Victoria.—Captain Harris, late of the McKinley-Darragh, is in charge of operations here now.

Red Rock.—Mr. R. W. Thomson has taken charge of the work here. He is a Canadian, who has been mining on the Rand for some years.

Kerr Lake Crown Reserve.—Seven tons of ore were shipped by express to New Jersey, for treatment. It is expected that \$50,000 will be realized from this shipment as it was specially selected. On the night of the 29th of February, the ore house was broken into, and about \$1,000 worth of rich ore stolen. The men who took it were arrested a few days later, and the ore recovered, together with a sack of ore stolen from the Silver Queen. The men were sentenced to one and a half years in the Central Prison.

In going east in the cut, at a depth of 40 feet, what is probably the richest showing ever made in this camp, was met with. The vein here is 25 inches in width, calcite, smaltite, native silver and a little niccolite. Nipissing "49" in all its glory was hardly equal to this. There is nothing in the camp that can compare with the present showing. The vein is thought to be the extension of the Kerr Lake big vein. This find is close to the Silver Leaf line. These latter people are sinking on the same vein.

Silver Cross.—No. 2 shaft is now down 60 feet. At a depth of 50 feet a new vein was encountered, which at the bottom of the shaft shows stronger and carries higher values. The main vein sunk upon, is here 7 inches wide, calcite and smaltite. The work of the past three weeks, 40 feet of sinking, has wonderfully improved this property.

It is expected that the concentrator on the Nipissing will start this week. This is a dry process and the results will be watched with much interest.

LARDER LAKE DISTRICT.—Little work is being done up here just at present. The Reddick expect to set up their twenty stamp mill as soon as milder weather sets in. It is on the ground now. A test of four tons, taken from the dump, was made a short time ago. This lot was run through a three stamp mill and gave results of ten dollars a ton. This is considered an average of the 1,000 tons now on the dump. There are three shafts sunk on this property, 20, 40 and 60 feet deep, respectively.

On the Maxwell-Harris property there is a ten stamp mill, and it is expected that milling will start very shortly.

Lorrain Township.—A rich find of native silver has been made in the unsurveyed portion of this township. When the samples were brought into Haileybury it caused quite a stampede. The samples show smaltite and wire silver. The vein is four inches in width, and has been opened up for some distance. It is stated that the find is in the Keewatin.

Montreal River.—Preparations for extensive development work in the spring are being made, and supplies and equipment are being sent in. Of all the claims passes by the inspector, up to date, 160 of these were passed on native silver showings.

Rib Lake.—In the Harris mine, 16 feet of clean pyrite has been met with in cross cutting. This new ore body runs parallel to that now being worked.

ALBERTA.

EDMONTON.

When the Compensation Act came up in the House for its final reading, there were a number of amendments. The compensation to dependents in case of fatal accident was raised from \$1,500 to \$1,800, and in the clause providing that a workman should not receive compensation for injuries sustained while at work on a building less than 40 feet high, the 40 feet limit was altered to 30 feet.

The Socialist element in the labor ranks is not at all satisfied with the bill; the reason, probably being that it will remove a grievance and thus give the agitator less chance to enlarge on the sufferings of the workman..

The majority of the Labor men and especially the leaders in the miners' union are well pleased with the Act.

During the debate on the Compensation Act, the privilege of a seat on the floor of the House was accorded by the House to any labor delegate whom any member would care to have beside him to aid him. Mr. Simmons, the member for Lethbridge asked that Mr. Frank Sherman president of District 18 U. M. W of America, as representative of one of the largest labor unions in the country, be permitted to take a seat beside any of the members in the House.

The Socilistic element, as already stated, is against the Act, and at a meeting held in Edmonton adopted the following resolution:—

Whereas, the principle of compensation to workmen for injuries received in industrial pursuits is admitted in all civilized countries, and

Whereas, that 40 foot clause and other exemptions strike at the basic principle of compensation, and

Whereas the amount of compensation re weekly payment and death benefit is entirely inadequate, and

Whereas, the experience of Great Britain in the working out of compensation, despite the existence of the most perfect friendly society machinery in the world, has proven the impracticability of schemes in which contributions are made by the employees has caused the gradual elimination of this feature, and

Whereas, this meeting believes that the only sound, economic and just principle for compensation is payment for the injury through the employer who makes insurance an item in the cost of the manufacturer of the commodity in which he trades.

This meeting hereby places itself on record as being opposed to any compensation act passed in disregard of these facts.

Mr. F. H. Sherman, of Taber, president of District 18 of the United Mine Workers of America, interviewed in Edmonton, stated:—

“The Alberta Government has redeemed its promise to the coal miners, although we would have liked to have gone somewhat further.

“On behalf of the United Mine Workers of America, the largest body of organized labor in this province, I desire to say that the labor legislation passed at this session of the Legislature, while not all that we have hoped for, is a great improvement on the old conditions. We believe this legislation to be an honest attempt to place the wage earners of this province upon an equal footing with the workers of other provinces in the Dominion. However, this legislation, while good so far it goes, cannot settle the question of labor and capital. We accept these new laws only as an instalment of what is due to the workers of this country.

“We desire to thank the entire Legislature for their unfailing courtesy to our representatives and for the considerate treatment we have received at their hands.

“The passing of the Eight Hours Bill will remove what has long been a bone of contention between us and our employers in this province, and therefore will tend in the direction of industrial peace.

“The Workmen's Compensation Act will result in greater care being taken for the protection of the lives and limbs of the wage earners, and, after all, that is what we require, for you cannot give adequate compensation to the widow and orphans for the loss of their bread winner, nor to a worker for the loss of his limbs.

“The Compensation Act places a value on the lives of our workmen, and we know from experience that steps will be taken by employers of labor to safeguard them.”

Lewis Stockett, general manager Bankhead Mines, Limited, and O. E. S. Whiteside, general manager of the International Coal & Coke Company, interviewed the Cabinet on behalf of the Western Coal Operators' Association, with the object of obtaining certain amendments to the Compensation Act and the Eight Hours Bill. They wished to have a clause inserted in the Compensation Act whereby the dependents of a man killed or permanently disabled could not obtain compensation if it could be proved that such man's injury or death was due to his own negligence.

In the Eight Hours Bill they wished several changes made. They want a clause inserted in the bill permitting a mine owner or operator to work his mine not exceeding 60 days in any one calendar year, for one hour per day more than the bill calls for. They claim it would be an advantage to the miners and the public that mines producing domestic coal especially be allowed to work for a longer period during the winter season. The operators also wish a clause making the hours for the men engaged in the handling and transportation of the coal eight hours at their working place. They claim this would work no hardship on these men for the reason that they are not continuously engaged in hard work, as the miner is at the face, and also that they are not exposed to the same danger as the miner. It is also claimed that a great many of these men are drivers, and drive horses and mules and it is necessary that these horses and mules have a lunch hour as well as the men, so that the men and the animals can be fed and watered.

In the case of contract miners they can have their lunch while waiting for shots to be fired or at any other time whenever they have a few minutes to spare, and often in the case of the mine drivers they can eat their lunch while riding on their cars.

The report of the Public Works Department laid on the table of the House shows that the coal production for 1907 in the Province of Alberta exceeded all previous records, amounting to no less than 1,800,000 tons.

Thirty-five new mines were opened and ninety-seven were in operation during the year. Six mines were abandoned and two closed mines were re-opened. In the mines there were 105 accidents, some of these being very slight. Out of these 105 accidents there were 17 fatal accidents inside and two fatal accidents outside mines, and 18 accidents resulting in serious injury. There were 3,500 persons employed in the mines.

STRATHCONA.

The King has allowed Margaret Jane Lamb, of Newcastle-on-Tyne, Eng., the Edward Medal of the first class in recognition of the gallantry of her brother G. H. Lamb, who lost his life in an endeavor to save the life of the men in the Stratheona Company's mine at Stratheona. The medal presented to Miss Lamb is the second awarded by the King, who founded the medal in 1907 in recognition of the bravery of miners.

The King personally presented the first medal to the recipient.

LETHBRIDGE.

The Public Accounts Committee of the Federal Government at Ottawa investigated the attempt of F. C. Coldwell to obtain 75,200 acres of coal lands near Lethbridge. The regulations up to March last year forbade the acquiring of more than 320 acres by one person from the Department. Coldwell, in March, 1906, sent in 235 applications over the names of different persons, accompanied by a bulk cheque for the necessary \$5 fees. Though the Department does not issue forms, many of these were on printed forms and the signatures very vague, many only having the initials of the Christian names and some only having surnames.

Forty-seven applicants were women. Many were chamber maids and bell boys in the Russell House, Ottawa.

The purport of the examination was to ascertain what precautions were taken by the Department. H. H. Rowan, the present head of the Mines Branch of the Department, explained that it was not the business of the Department to scrutinize the applications until called upon to issue patents, when steps would be taken to identify the applicants and make sure of their good faith.

Only ten of the applications were granted.

DIAMOND CITY.

Development work at the mines has been proceeding rapidly all winter, but has been temporarily stopped. The building operations in connection with the surface plant have also stopped, all the available brick being used up. The Diamond Coal Company manufactures its own brick from an excellent clay deposit on the property, and as all the bricks made last summer have been used, building operations will cease till spring opens up and new kilns of bricks can be burned.

BRITISH COLUMBIA.

THE KOOTENAYS.

Mining in Rossland is taking on a little brighter aspect at present than it has experienced for some months back. A rich ore shoot carrying gold from \$17 to \$40 per ton has been cut on the 1,650 foot level of the Le Roi mine. This is encouraging in the face of the fact that the values on the 1,650 foot level so far have been rather low. As to whether this new strike will prove to be extensive, that will depend on future development work, but the company has been working in the ore for a couple of weeks. The ore is of a pyritic character and where the quartz is mixed with it the gold values run high. At the same time there is an excess of iron over silica.

Shareholders of Le Roi 2 Company have been informed by cable that they are to receive another dividend of two shillings per share. The Blue Bird, Red Eagle and Homestake properties have been leased in the South Belt and several others are covered by options. The coming summer will see much activity in this section. It is to be hoped that the lessees will strike something good and prove up this part of the camp. They have some good ore in sight, averaging \$50 to the ton.

Rossland will receive at least \$3,000 of the 2 per cent. tax as its share this year, but will make an effort to get more. It is claimed that the city should receive \$20,000 of this tax per annum. Owing to the Government taxing the mines which are in the city limits the corporation of the city of Rossland cannot collect from them.

The following tonnage was shipped from the camp during the week ended March 3rd:—

| | Tons. |
|-------------------------|-------|
| Centre Star, Cons. | 3,180 |
| Le Roi | 1,249 |
| Le Roi 2 | 770 |
| Evening Star | 30 |
| Total | 5,229 |

At the Trail smelter during the same week 4,708 tons of ore were received, not including the ore received from Rossland mines. The St. Eugene sent 398 tons, War Eagle 174, North Star 68, Vancouver 20 and many other smaller lots.

The Consolidated Mining & Smelting Company of Canada has issued a statement to the shareholders of operations for the period from July 1st to December 31st, 1907. The following were the shipments from the three mines:—

| | |
|-----------------------------------|---------------------------|
| Centre Star group, Rossland | 87,451 tons (gold-copper) |
| St. Eugene group, Moyie | 75,104 tons (silver-lead) |
| Snowshoe group, Phoenix | 86,109 tons (copper-gold) |
| Total | 248,664 tons |

The St. Eugene produced 12,110 tons of silver-lead concentrates. The average amount of ore received at Trail smelter was 1,116 tons per day. Amount of lead-silver bullion produced was 42 tons per day, valued at \$165 per ton; copper matte 14.8 tons at \$453 per ton; pig lead 38.4 tons, value \$97 per ton. The gross value of the output for the year will approximate \$6,000,000. The ore reserves in the mines are looking very well. Another recent shipment of 120 tons of ore from the lower workings of the War Eagle at Rossland carried \$40 per ton in gold. The ore recently encountered in the Le Roi is of the same appearance and character as that found in the lower depths of the War Eagle.

While the Granby profits have closely approached the disappearing line with the recent fall in copper, they are yet actively pursuing mining and smelting operations, and in fact have broken a couple of their former time records. The smelter treated 3,450 tons of ore in 24 hours a week ago and for the week ended February 29th they exceeded all former records and shipped 22,938 tons from mines to smelter. The total ore shipments for the year so far have been 146,947 tons. The smelter treated 22,545 tons during the above week, making 146,673 tons for the year to that date. The pay roll at the Granby mines is \$50,000 per month, and there are 340 men working around the smelter at Grand Forks, the pay roll averaging \$30,000 per month.

The Boundary mines shipped during the year 1907 a tonnage of 29,423,856 as against 30,375,924 tons for the calendar year 1906. The hours of work at the Granby mines have been changed to conform with the law and hereafter the eight hour shifts will begin at 8 a.m., 4 p.m. and midnight, instead of an hour earlier as heretofore.

The Snowshoe and other Boundary copper mines have made no move to resume operation, and it is not likely that they will do so until copper makes an advance of two or three cents per pound.

The new 500 horse-power motor and part of the new Rand tandem, compound, duplex, Corliss, 3,474 foot air compressor which is will drive have arrived at the British Columbia Copper Company's mine, and will be in readiness to operate when work is resumed.

The Crescent Mining Company, a Chicago enterprise, shipped a 20 ton car of high grade ore last week. This ore is being stoped from the 225 foot level and it is expected will return the company about \$100 per ton. The electrical plant is working well. A shaft is being driven on the Tip Top, another high grade property, and is now down 100 feet.

A small force of men are working on the Maple Leaf group in Franklin camp. If the property turns out well and the \$125,000 bond is taken up by the New York Company it is understood that a merger will be attempted and other important Franklin camp properties secured. In case this was done a smelter would be built at Franklin, as the ores are low grade and a lot of the profit is eaten up by hauling to distant smelters.

Getting out railway ties furnished employment to over 400 men in the Boundary this winter. In the local camps over 400,000 were made, which at 30 cents a piece means the distribution of \$120,000 among local interests.

At the Nickle Plate mine of the Daly Reduction Company, Hedley, over 140 men are now employed. The company did not experience any friction when the wage scale was lowered all over the district, and their miners are now receiving \$3.50 for eight hours, the same as is paid in the Boundary and elsewhere. The company has 110 stamps dropping in its mill at Hedley and is shipping high grade concentrates. Nickel Plate ore carries \$80 per ton in gold and silver.

A strike of good gold ore in new ground has been made at the Queen mine, Salmo. The ore was opened up at the bottom of a shaft 80 feet below the fourth level of the mine. The ore encountered is six feet wide, while the ledge higher up the hill is only four feet in width. Manager Waldie has completed the installation of his new 10 stamp mill, which now gives him twenty stamps

altogether. A new Jenckes hoist and a Rand air compressor are on the way to the mine and will be installed before the snow disappears. The Nugget, Mother Lode and Kootenay Belle are all shipping a small tonnage regularly. The Fern mine is being operated.

The Hewitt Mining Company has shipped another car of silver-lead ore carrying 185 ounces silver and 7.5 per cent. lead.

The Krao mine, which was floated at Butte last year with a capital of \$600,000, may be consolidated with adjoining Ainsworth properties and capitalized for \$2,000,000. Meantime, it will be necessary to run a long tunnel to tap the ore bodies at depth, owing to the inflow of water in the shaft workings.

The Westmount mine has shipped a car of pyritic ore carrying 300 ounces of silver. This high value of silver in the iron pyritic

ore has proved something of a surprise to mining men in that section, and it is stated that the prospectors will not overlook pyritic showings this coming season.

The output of the Ferguson Mines Company for the year 1907 averaged 150 tons per month, valued at \$140 per ton in gold, silver and lead.

If the copper and timber markets pick up a little within the next few months British Columbia will experience a year of splendid prosperity. What with the heavy expenditures that will be made in connection with work on the Grand Trunk Pacific, Canadian Pacific and Great Northern and the mining industry looking very good, considering the present state of affairs, the people of this province should enjoy a prosperous year.

GENERAL MINING NEWS

NOVA SCOTIA.

GLACE BAY.—Shortly after noon on March 8th the coal washer of the Dominion Coal Company at Port Morien was completely destroyed by fire. The loss will reach about \$100,000. Considerable coal was also lost. This is the second fire within two years. Sixty thousand tons of coal monthly was the working capacity of the plant, about fifty thousand of which were shipped to the Everett Gas & Coke Company, near Boston.

SYDNEY.—The Dominion Iron & Steel Company at No. 2 slope, Wabana, Newfoundland, on Friday, February 28, broke all previous records in hoisting thirteen hundred tons of ore from a single slope. This record for an iron ore mine is said to be unprecedented in America.

HALIFAX.—It was announced on Wednesday, March 4th, that Mr. Graham Fraser, popularly termed "the father of the iron and steel industry in Nova Scotia," had been elected a director of the Dominion Coal Company, to fill the vacancy created by the resignation of Senator David McKeen. The other Nova Scotian on the Board is Mr. W. B. Ross, K.C., of Halifax.

BRITISH COLUMBIA.

NELSON.—For the week ended February 22nd a larger number of mines, including some new producers, have made shipments. Both the British Columbia Copper and the Dominion Copper are still shut down; but the Granby is putting out a record tonnage at mine and smelter. At Rossland the Centre Star is increasing its

tonnage; but Le Roi is limiting itself to about 1,500 tons. The Westmount, a new Slocan mine about 10 miles from Slocan city, made a shipment of one car of rich silver ore in which iron pyrites is associated with the silver bearing minerals.

ROSSLAND.—The Red Eagle mine has been leased by Dr. D. E. Kerr and N. Smith to Richard Hooper, Martin Daly and Samuel Lynn for a year and a half.

VICTORIA.—The bill now before the British Columbia Legislature to amend the Placer Mining Act fixes the size of placer claims in creek diggings at 250 feet in the general course of the stream and 1,000 feet in width, measurement from the general course of the stream 500 feet on either side of the centre thereof. Bar diggings are fixed at 250 feet square on any bar covered at high water, or a strip of land 250 long at high water mark from high water mark to low water mark. Dry diggings to be 250 feet square.

The bill authorizing a loan of \$10,000 to the Canada Zinc Company was read a third time and passed, the Premier stating, in reply to Mr. Hawthornthwaite, that the operation of the process would be watched by an officer of the Government on its behalf.

PHOENIX.—The new Boundary shipper, the Crescent mine, will ship one or two cars of gold-silver ore per month. The shipping ore is stoped from the 250 foot level. Only a dozen men are employed.

NELSON.—For the week ending February 29th the Granby mines shipped the largest amount of the year—22,919 tons of ore as compared with 17,147 tons during the previous week. The Granby smelter treated 22,546 tons, also a record.

MINING NEWS OF THE WORLD.

GREAT BRITAIN.

The bill to amend the Coal Mines Regulation Acts by limiting the hours of work underground to eight was introduced in the House of Commons by Mr. Herbert Gladstone on February 20th and read a first time.

The King Edward medal, instituted as a reward for gallant conduct in saving or attempting to save life in mines was personally presented by King Edward on February 27th to Francis Chandler and Wm. Everson. Miss Margaret J. Lamb, a resident of Newcastle-on-Tyne, also received the medal as a recognition of

the bravery of her brother, G. H. Lamb, who lost his life in an attempt to save the lives of comrades in the Sthratheona mine, British Columbia.

NORWAY.

The Hohenloche-Werke-Akbiengessellschaft, a German company, have acquired extensive deposits of zincblende and galena in Norde Hakedal and Nannestad at a price of about £31,000.

The Hassel iron mines, which have not been in operation for more than century, are to be reopened by a company which is be-

ing organized with £47,000 capital. The ore will be smelted with charcoal obtained from the waste wood of the neighboring forests and saw mills.

GERMANY.

The Prussian Government, which operates in all 39 mines of various minerals, and numerous metal works, realized a surplus of £1,372,242 on the year's operations for 1906. These industries employ 89,130 men.

A noteworthy paper was read by Mr. A. Haarmann, of Osna-bruck, a leading German railway authority, at the last meeting of the society of German Ironmasters at Dusseldorf, in which he expressed the opinion that iron should take the place of wood as material for railway sleepers. He submitted figures to show that in iron-producing countries the wooden sleeper cost at least 85 per cent. more than the iron sleeper.

An expedition which since last July has been prospecting for phosphates in the German Islands in the South seas has found deposits on several islands, those of Fais, of the West Carolines and Angauer in the Palan group being especially rich.

RUSSIA.

Dredging for gold in the Ural and the Enisseysk mining district has proved a failure. Of 50 dredges working in Russia only four or five have yielded a profit.

Extensive deposits of quartz and placer gold have been discovered along the Peitcha river in Ussuri province, but prospecting and work have been interfered with by Chinese robbers.

The coal basin of Kussnetska, Western Siberia, where as much as 250,000,000 poods of coal are in sight, will shortly be connected with the Siberian Railway.

AUSTRALASIA.

At the Mount Lyell copper mine, Tasmania, boring at the 1,000 foot level has shown the downward continuation of one of the shoots worked at the 850 foot level and largely increased the estimate of the ore reserves.

The mineral yield of New South Wales for 1907 is a record one, being valued at £10,577,378 as compared with £8,169,625 in 1906. The number of persons employed in mineral production was 43,758.

The gold output of New Zealand for January last amounted to 59,072 ounces, valued at £231,508, as against 27,510 ounces, value £107,117, for January, 1907.

INDIA.

The development of the manganese industry in the Central Provinces has been very rapid, especially in the Balaghat district, from which about 21,000 tons were shipped in 1904-5. During the year ending June 30, 1906, the shipments were over 50,300 tons, and the quantity has since been steadily increasing.

SOUTH AFRICA.

The Transvaal Chamber of Mines has instituted a competition in rock drills. Manufacturers are asked to send out from six to nine drills to work under ordinary mining conditions for a period of from four to five months under the supervision of a committee. The prizes for the manufacturers is to be £4,000 and £1,000, and

to the operators not less than £250. The trials are to commence January 1st, 1909.

The net gain in the number of native laborers employed in the Transvaal mines during January was 11,914, the total number employed at the end of the month being 118,204.

Several amalgamations of Rand mining properties are being negotiated with a view to economy in operation. The consolidation of the Klipriversberg Estate and several other concerns, if effected, will place 1,085 mining claims under one management.

A copper proposition some 18 miles northwest of Upington, Cape Colony, 45,000 acres in extent, is being opened up by Mr. W. Bleloch and his associates.

UNITED STATES.

The Wayne Iron Company has acquired 600 acres in Wayne county, New York, which it is estimated will produce from 3,500,000 to 4,000,000 tons of iron ore. They expect to get out about 1,000 tons a day, which will be placed on the market this season. The property is about 75 miles from Buffalo.

A law goes into effect in Indiana May 1st prohibiting railroad companies from owning coal mines and coal lands in the State. A big combine in which railway magnates are prominent is being formed to take over the coal mining properties.

Work has been resumed in the mines of the Amalgamated Copper Company, Butte Coalition, and North Butte Companies at Butte, Mont., which have for some time been idle. It will be about four months before any copper can be produced for the market.

MEXICO.

An explosion recently took place in the La Rosita coal mine of the Sabines Coal Company at Sabines, Coahuila, by which about 100 miners, Japanese and Mexicans, were killed. Fire damp is believed to have been the cause.

Mr. Frank G. Stevens, representing Canadian and British capitalists, has purchased mines in the Hostotipaquillo district, Quada-lajara, from Carlos Romero. Mr. Stevens will devote his attention to operating the properties, which include the Mololoa mine, one of the oldest in the district.

Mr. J. W. Bryant, representing the Tye Copper Company of British Columbia is in Mexico in connection with a project for procuring Mexican ores for smelting in British Columbia.

The famous Calumet and Hecla mine, which has just sliced its quarterly dividend from \$15 to \$5, has paid out \$107,350,000 in dividends since its inception.

The stock a year ago sold as high as \$1 a share, but yesterday was down as low as 60¢, breaking 49 points on the declaration of the dividend.

In 1903 the stock was as low as 38¢.

The mine's dividend record since 1900 is as follows:—

| Year. | Per share. | Amount. |
|-------|------------|-------------|
| 1900 | \$75 | \$7,500,000 |
| 1901 | 45 | 4,500,000 |
| 1902 | 25 | 2,500,000 |
| 1903 | 35 | 3,500,000 |
| 1904 | 40 | 4,000,000 |
| 1905 | 50 | 5,000,000 |
| 1906 | 70 | 7,000,000 |
| 1907 | 65 | 6,500,000 |
| 1908 | 15 | 1,500,000 |

COMPANY REPORTS.

DOMINION COAL COMPANY, LIMITED.

Report of Directors for year ending December 31st, 1907.

COMPANY'S OPERATIONS.

The output for 1907 was 3,541,253 tons, as compared with 3,552,746 tons for 1906, or 11,493 tons less than in the corresponding period. The decrease was due to the fact that mining operations had not been resumed at No. 7 mine since the fire which occurred in December, 1906. The business of the company has been adversely affected by the following circumstances:—

The weather experienced throughout the winter and the spring was abnormally severe, thereby delaying the opening of navigation at Sydney by about four weeks, and owing to the presence of drift ice along the Nova Scotia coast and in the Gulf, the regular shipments to the St. Lawrence did not begin until June 6th. These unusual conditions rendered it impossible to get up the full quantity of coal required for St. Lawrence points during the season of open navigation; supplementary shipments had to be made via Portland, Maine, after the closing of the river, entailing heavy additional cost of railway carriage from that port to Montreal. The delays to steamers also caused an increase in the freighting costs.

Mining costs have continued to increase greatly, by reason of the scarcity of labor, the irregular working of men and the high prices paid for all materials used at the mines, including hay and feed for the horses; these conditions were the most unfavorable in the history of the company.

COMPANY'S PROPERTY.

No. 7 mine was idle nearly all the year on account of the fire as above noted, which destroyed the bankhead and all surface works, and necessitated the flooding of the mine from the ocean. The flooding was stopped on January 29th, 1907, and pumping out commenced immediately after; the first coal was hoisted on November 27th. All surface works have been replaced and are now in first-class order, and the mine in condition to give a normal output next season.

New Works.—One of the new mines (No. 12) referred to in the last annual report, has been opened in the Lingan-Victoria district. The main slope has been driven 390 feet, and the back deep 335 feet, and first levels have been broken off. The prospects in this district show great promise and when fully developed the new colliery will produce a substantial output. The construction of the branch line (about seven miles in length) connecting this district with the main line of the company's railway, has been commenced. The bush has been cleared for four miles and grading completed for two miles. Some 368 acres of land have been purchased for the surface works, town site and reservoir, and the necessary clearing has been completed to a sufficient extent to admit of the erection of the temporary mine buildings, boarding houses and stables.

Following the policy already established by your directors to safeguard in every possible manner life and property, careful attention has been paid to the prevention of fires both for underground and surface works. All collieries are periodically inspected by a special fire inspection committee, and regularly drilled fire brigades are organized at each of the collieries. Safety lamps are now in us at all mines.

A rescue station at a central point with full equipment has been established, including twenty sets of "Draeger Breathing Apparatus," to enable men in any emergency to work in a poisonous atmosphere. A volunteer corps for such service has been organized and the men have been drilled in the use of the apparatus by a competent instructor brought over from England.

A horse hospital has been erected, in which the sick and injured mine horses are properly treated with satisfactory results.

Wrecking Plant.—In response to the invitation of the Federal Government to tender for the establishment of a wrecking plant to afford aid to wrecked, disabled or stranded vessels within the coastal waters of the Maritime Provinces and the Gulf of St. Lawrence, an offer was submitted by the company which was accepted, and an agreement entered into for five years. Certain of the company's steamers have been assigned to this duty and a complete outfit purchased. During the eight months of its existence assistance has been rendered to eleven vessels.

New Coast Steamer.—Owing to the great difficulty experienced in obtaining schooners to carry on the coastwise trade, a specially designed steamer was built in Scotland to the company's order. This steamer, the "Cabot," arrived at Sydney on September 21st, and has been continuously employed in the trades since that date.

Loading Plant at Glace Bay Harbor.—A trestle and chute have been erected at this point to provide return cargoes for sailing craft coming in with lumber and produce, and the berth in this harbor dredged to enable vessels to lie alongside. These facilities have proved advantageous to the company.

Rolling Stock, Etc.—One new main line locomotive and one new bank-switching locomotive have been purchased during the year. Also one new steam shovel for the banking station. The capacity of the banking station has been increased by building new turn-out and trestle. Scales for weighing coal on cars have been installed in Nos. 1, 2 and 4 colliery yards. A new foot turntable has been erected at the Glace Bay round house.

New dwelling houses for miners were erected as follows:—No. 5 colliery, 29 houses; No. 4 colliery, 1 house; mechanics' row, 1 house; and one boarding house in No. 2 district, and construction started on one hundred additional houses at various places. A census was taken in October showing a total population of 10,600 persons occupying the company's houses.

A new bankhead to serve both Emery and Phalen seams at No. 5 colliery has been built and was put in operation on July 1st, replacing the old bankhead destroyed by fire in October, 1906. Also a new machine shop equipped with all necessary modern tools.

Electric Power Transmission.—The third unit has been installed at the central electric station at No. 2, and the use of electric power extended during the year by the installation of an electric underground haulage engine at No. 3 colliery, the introduction of electrically driven turbine pumps at several collieries, electric motors to run the central machine shop at Glace Bay and at No. 2 colliery, and the bankhead machinery at No. 5 and No. 7 collieries, and for hoisting tanks at No. 8 water shaft.

The company's property generally has been maintained in a state of efficiency and the development of the mines regularly carried on so as to insure the best possible results.

Company's Stores.—The management of the Commercial Stores, which was found to be most unsatisfactory, has been completely changed and the pernicious system of allowing long time and indiscriminate credits to workmen discontinued. A careful inventory of the goods in stock has been taken and loss for depreciation provided for.

GENERAL.

The suit taken against the company by the Dominion Iron & Steel Company, referred to in the last annual report, was tried at Sydney (July 30th to August 19th) before Mr. Justice Longley, and judgment given in the plaintiff's favor on September 15th. Your directors have throughout been acting upon the advice of eminent counsel, but after this reverse for their fuller satisfaction they took other counsel into consultation, who were unanimous in their opinion that the Coal Company's contentions were right and would eventually be maintained. The appeal taken

before the Supreme Court of Nova Scotia was heard at Halifax on December 17th, 1907, and a decision in favor of the Steel Company was given on January 14th, 1908. Since receiving this second adverse judgement, and in view of the appeal which has been taken to the Privy Council, your directors have submitted the case separately to three prominent members of the Ontario bar, and to two United States lawyers of high standing. In each case an entirely favorable opinion has been received, and your directors consider that the recent decisions should be reversed and judgment given in favor of this company.

Your directors regret that the annoyance and expense of a protracted litigation should continue to be borne by the company, but as no genuine response has up to the present been made by the Steel Company to the numerous overtures put forward from time to time by influential friends of the two companies for a settlement on fair and equitable lines, the only alternative would have been complete surrender to the Steel Company's unreasonable demands. The questions involved are so vital to the prosperity of this company and your directors' belief in the justice of the company's cause and its ultimate success in the suit being well assured, they have had no alternative in the best interests of the shareholders but to earnestly prosecute the appeal to the Privy Council.

Your directors, however, continue ready to discuss any feasible scheme of settlement offered by the Steel Company, recognizing that in view of the intimate relations which must inevitably exist between them, an amicable termination of the dispute would redound to the greater advantage of both companies.

Respectfully submitted,

JAMES ROSS, President.

PROFIT AND LOSS ACCOUNT.

For Year 1907.

| | |
|--|--------------|
| Net proceeds from sale of coal and net income from steamships, railways, real estates, etc. | 2,094,539.23 |
| Less | |
| Interest on bonds | 250,000.00 |
| Dividend on preferred stock | 210,000.00 |
| Miscellaneous interest | 32,171.13 |
| Dividend on common stock | 600,000.00 |
| | 1,092,171.13 |
| | 1,002,368.10 |

Certified correct,

W. S. ANDREWS, Auditor.

At the annual meeting of the British Columbia Copper Company, held recently in Charleston, W. Va., the president, Mr. Colgate Hoyt, asserted that the year ended November 30th, 1907, had been the hardest in the history of the company. The fuel famine of last spring, the recession of copper prices, and the shortage of cars were, according to Mr. Hoyt, the chief reasons for the trying times. The capacity of the excellently equipped smelter at Greenwood is 2,000 tons of ore per day, but during the past year the plant could only be operated at about one-half its capacity. The dividend of 40 cents per share paid last July had been made possible by high prices and continuous operations.

Had it been possible to get the price for the copper shipped at date of shipment, the net profits of the company would have been \$396,534.30.

Two hundred and sixty-eight thousand two hundred and thirty-one tons of ore was mined on the company's own properties. The Lone Star and Washington property was purchased and paid for—the consideration being \$75,000. Development work was performed at an outlay of \$114,898. The mines and reduction works were closed in November pending a rise in copper.

The profit and loss account for the year ended November 30th, 1907, is as follows:—

| | |
|--|-----------|
| Balance Dec. 1st, 1906 | \$231,022 |
| Premium on stock sales | 57,118 |
| Adjustment account | 21,724 |
| Income for year ended Nov. 30, 1907..... | 88,158 |
| | \$398,018 |
| Expenses | 20,777 |
| Net | 377,241 |
| Dividends | 201,200 |
| Surplus | 176,041 |

The directors re-elected include:—Copely Amory, Anthony N. Brady, C. H. Burke, Newman Erb, Colgate Hoyt, Edwin Hawley, B. B. Lawrence, J. C. Reiff, F. L. Sommer, C. A. Starbuck, and F. L. Underwood.

At the annual meeting of the Crow's Nest Pass Coal Company, held in Toronto March 10th, the following officers were elected:—Mr. G. G. S. Lindsey, President; Hon. Robert Jaffray, Vice-President; Sir Henry Pellatt, Second Vice-president; Mr. E. R. Wood, Treasurer; Col. W. P. Clough (New York), Mr. H. B. McGiverin (Ottawa), Mr. C. E. Whitney (Ottawa), Mr. Elias Rogers (Toronto) and Mr. Jay P. Graves (Spokane), directors. The report for 1907 was submitted, showing net profits for the year of \$382,986.28, an increase of \$31,195 over 1906. To this has been added \$353,592.42, balance at credit of profit and loss brought forward from 1906, and \$324,420 representing premiums on new stock, making a total of \$1,060,998.70. From this amount four quarterly 2 1-2 per cent. dividends have taken \$355,178.98, \$324,420 has been transferred to reserve, and \$381,309.72 has been carried forward to credit of profit and loss. The amount of coal mined in 1907 was 981,939 tons, as against 806,901 tons in 1906, and the production of coke was 231,368 tons, as against 213,295 in 1906. A strike of the miners in April, and the closing down of the smelters, materially lessened the company's output. During the year the company spent in improvements a total of \$493,818.73. The report states that the costs of mining and coke-making in 1907 were increased greatly by reason of the advance in wages to miners, the irregular working of the men, the scarcity of labor, expense of securing new miners, higher prices of material, increase in freight rates, larger cost of compensation for injuries to workmen, and extremely severe weather during the first three months of the year. Besides, a fluctuating demand for coal involved pressing the mines at times for tonnage, which naturally raised the cost. These conditions were the most unfavorable in the history of the company.

The annual meeting of the shareholders of the Intercolonial Coal Mining Company, Limited, took place recently at the office of the company, room 312 Merchants Bank Building.

The output of coal and coke for the year ending 31st December, 1907, amounted to 317,599 tons.

The following gentlemen were elected directors for the coming year: Messrs. James P. Cleghorn, W. M. Ramsay, A. W. Hooper, R. MacD. Paterson, K. W. Blackwell, E. Goff Penny and D. Forbes Angus.

At a subsequent meeting of the board, Mr. James P. Cleghorn was re-elected president, Mr. D. Forbes Angus was re-elected vice-president and managing director, and Mr. C. A. Dowd was appointed secretary-treasurer.

The Kerr Lake Mining Company has declared the regular dividend of 2 per cent. quarterly with a bonus of 1 per cent.

STATISTICS AND RETURNS.

PRELIMINARY REPORT ON THE MINERAL PRODUCTION OF CANADA IN 1907.

(Subject to Revision.)

METALLIC.

| Product. | Quantity. | Value. |
|---|------------|-------------|
| | (a) | (b) |
| Antimony ore, tons | 2,016 | \$ 65,000 |
| Copper, lbs. | 57,381,746 | 11,478,644 |
| Gold—Yukon | | \$3,150,000 |
| Gold—All other | 5,114,765 | |
| | | 8,264,765 |
| Iron ore (exports) (c), tons | 25,901 | 45,907 |
| Pig iron from Canadian ore (d) tons . . | 107,599 | 1,982,307 |
| Lead (e) lbs. | 47,565,000 | 2,532,836 |
| Nickel (f) lbs. | 21,189,793 | 9,535,407 |
| Silver (g) oz. | 12,750,044 | 8,329,221 |
| Cobalt, zinc, and other metallic products | | 200,000 |
| Total metallic | | 42,434,087 |

NON-METALLIC.

| | | |
|---|------------|------------|
| Arsenic (refined) lbs. | 660,080 | 36,210 |
| Asbestos, short tons | 62,018 | 2,482,984 |
| Asbestic, short tons | 28,519 | 22,059 |
| Chromite, short tons | 7,196 | 72,901 |
| Coal, short tons | 10,510,961 | 24,560,238 |
| Peat, short tons | 50 | 200 |
| Corundum, short tons | 1,892 | 177,922 |
| Feldspar, short tons | 12,584 | 29,809 |
| Graphite, short tons | 579 | 16,000 |
| Grindstones, short tons | 5,382 | 46,876 |
| Gypsum, short tons | 475,508 | 642,470 |
| Limestone for flux in iron furnaces, short tons | 359,503 | 298,097 |
| Mica, short tons | | 333,022 |
| Mineral pigments—Barytes, short tons . . | 2,016 | 4,500 |
| Mineral pigments—Ochres, short tons . . | 5,828 | 35,570 |
| Mineral water, galls. | 250,985 | 110,524 |
| Natural gas (h) | | 748,581 |
| Petroleum (i), bbls. | 788,872 | 1,057,088 |
| Phosphate, tons | 750 | 5,514 |
| Pyrites, tons | 39,133 | 189,353 |
| Salt, tons | 72,697 | 342,315 |
| Talc, tons | 1,534 | 4,602 |
| Tripolite, tons | 30 | 225 |
| Total | | 31,217,060 |

STRUCTURAL MATERIALS AND CLAY PRODUCTS.

| | | |
|---|-----------|------------|
| Cement, natural rock, bbls. | 5,775 | 4,043 |
| Cement, Portland, bbls. | 2,368,593 | 3,374,828 |
| Flagstones, square yards | 3,000 | 2,550 |
| Sands and gravels (exports) tons | 298,095 | 119,853 |
| Sewer pipe | | 1,211,000 |
| Slate, squares | 4,335 | 20,056 |
| Building material, including bricks, building stone, lime, etc., estimated on the basis of production in 1906 | | 7,500,000 |
| Total structural materials and clay | | 12,232,330 |
| Total all other non-metallie | | 31,217,060 |
| Total non-metallie | | 43,449,390 |
| Total metallic | | 42,434,087 |
| Estimated value of mineral products not returned | | 300,000 |
| Total, 1907 | | 86,183,477 |

(a) Quantity of product sold or shipped.

(b) The metals, copper, lead, nickel and silver, are, for statistical and comparative purposes, valued at the final average value of the refined metal in New York. Pig iron is valued at the furnace, and non-metallic products at the mine or point of shipment.

(c) Copper contents of ore, matte, etc., at 20.004 cents per pound.

(d) The total production of pig iron in Canada in 1907 was 651,962 short tons, valued at \$9,125,226, of which it is estimated about 107,599 tons valued at \$1,982,307 should be attributed to Canadian ore, and 544,363 tons, valued at \$7,142,919 tons ore imported.

(e) Lead contents of ore matte, etc., at 5.325 cents per lb.

(f) Nickel contents of matte shipped at 45 cents per lb.

(g) Silver contents of ore, etc., at 65.327 cents per oz.

(h) Gross return from sale of gas. Additional returns increase this item to \$803,908.

(i) Deduced from the amount paid in bounties and valued at \$1.34 per barrel.

ANNUAL PRODUCTION SINCE 1886.

| | |
|----------------|------------|
| 1886 | 10,221,255 |
| 1887 | 10,321,331 |
| 1888 | 12,518,894 |
| 1889 | 14,013,113 |
| 1900 | 16,763,353 |
| 1891 | 18,976,616 |
| 1892 | 16,623,415 |
| 1893 | 20,035,082 |
| 1894 | 19,931,158 |
| 1895 | 20,505,917 |
| 1896 | 22,474,256 |
| 1897 | 28,485,023 |
| 1898 | 38,412,431 |
| 1899 | 49,324,005 |
| 1900 | 64,420,983 |
| 1901 | 65,804,611 |
| 1902 | 63,211,634 |
| 1903 | 61,740,513 |
| 1904 | 60,073,897 |
| 1905 | 69,525,170 |
| 1906 | 79,057,308 |
| 1907 | 86,183,477 |

SUMMARY STATEMENT OF THE OUTPUT OF THE MINES IN THE PROVINCE OF QUEBEC FOR 1907.

(Courtesy of Mr. J. Obalski.)

| Kind of Minerals. | Wages paid. | No. of workmen. | Quantities shipped or used. | Gross value. |
|--|-------------|-----------------|-----------------------------|--------------|
| (Tons of 2,000 lbs.) | | | | |
| Bog iron ore | 28,974 | 100 | 22,681 | 80,231 |
| Calcined ocre | 20,197 | 75 | 2,300 | 29,430 |
| Raw ocre | | | 2,700 | 5,400 |
| Chromic iron | 31,801 | 76 | 6,407 | 63,130 |
| Copper ore | 103,884 | 250 | 29,574 | 160,455 |
| Asbestos | 915,081 | 2,081 | 61,833 | 2,441,919 |
| Asbestic | | | 29,193 | 27,293 |
| Mica, trimmed (pounds) | | | 550,247 | 199,848 |
| Mica, untrimmed | 100,600 | 275 | 91 | 13,660 |
| Phosphate | | | 408 | 3,410 |
| Graphite | 15,000 | 75 | 120 | 5,000 |
| Magnesite | | | 35 | 5,000 |
| Slate (squares) | 15,000 | 50 | 4,336 | 20,056 |

| | | | | |
|--------------------------|-----------|-------|------------|-----------|
| Flagstones (yards) | 1,350 | 6 | 3,000 | 2,550 |
| Cement (barrels) | 170,000 | 350 | | 640,000 |
| Granite (cu. yds.) | 238,761 | 653 | 51,873 | 560,236 |
| Lime (bushels) | 33,500 | 134 | 556,000 | 96,000 |
| Bricks | 300,000 | 1,462 | 94,000,000 | 525,000 |
| Tiles and pottery | | | | 270,000 |
| Limestone (cub. yds.) .. | 155,882 | 515 | 97,710 | 223,580 |
| | 2,130,010 | 6,092 | | 5,367,198 |

Note.—These figures do not include the value of the metal content of the ore, nor the pig iron and ferro-chrome manufactured in the province; nor do they include the natural gas. By adding these items the total value would be increased to \$6,000,000 or \$7,000,000. The figures above apply to prices paid at shipping points and have been compiled from the reports of operating companies. The figures are practically correct, but are subject to slight corrections.

ASBESTOS.

The production shipped, during the year of 1907, from the different districts of the province, is as follows:—

| Tons of 2,000 lbs. | Tons. | Value. |
|-----------------------------|--------|-------------|
| 1st class (crude) | 1,485 | \$367,188 |
| 2nd class (crude) | 2,888 | 456,073 |
| Fibre | 19,805 | 772,513 |
| Paper stock | 37,655 | 846,145 |
| Total | 61,833 | 2,441,919 |
| Asbestic | 29,193 | 27,293 |
| Total value | | \$2,469,212 |

Two thousand and eighty-one workmen have been employed and \$915,061 in wages were to them. They have worked the whole year in the principal mines.

MICA AND CHROME.

The production of mica shipped may be summed up as follows for 1907:—

| | Lbs. | Value. |
|---|---------|-----------|
| 1-2 Thumb trimmed | 204,276 | \$30,633 |
| 1-3 Thumb trimmed | 139,240 | 34,891 |
| 2-3 Thumb trimmed | 86,003 | 44,460 |
| 2-4 Thumb trimmed | 71,852 | 49,235 |
| 3-5 Thumb trimmed | 24,248 | 20,090 |
| 4-6 Thumb trimmed | 12,597 | 13,083 |
| 5-8 Thumb trimmed | 4,074 | 5,347 |
| Total thumb trimmed | 542,290 | 197,739 |
| Split | 7,957 | 2,109 |
| | 550,247 | 199,848 |
| Crude mica having undergone a first classification, 91 1-2 tons (2,000 lbs. to a ton) | | 13,660 |
| Total value | | \$213,508 |

The mica industry in the province has employed 275 workmen, of which 150 have worked on the mines and the others on the classification. The work has been done during the periods of 6 to 12 months, and a sum of \$100,600 has been paid in wages.

The production of chrome for 1907 has been as follows (2,240 lb. tons):—

| | Value. |
|-------------------------------|--------------|
| 1st class, in lumps | 145 \$ 1,925 |
| 2nd class, in lumps | 3,536 33,485 |
| Concentrated | 2,040 27,720 |
| Total | 5,721 63,130 |

Corresponding to 6,407 tons of 2,000 lbs.

Seventy-six workmen were employed during periods of 4 to 11 months.

MINERAL OUTPUT OF ONTARIO FOR 1907.

METALLIC.

| | Quantity. | Value. |
|--|------------|--------------|
| Gold, ounces | 3,810 | \$66,399 |
| Silver, ounces | 10,005,749 | 6,155,166 |
| Cobalt, tons | 751 | 104,426 |
| Nickel, tons | 10,972 | 2,271,616 |
| Copper, tons | 7,373 | 1,045,511 |
| Iron ore, tons | 205,295 | 482,532 |
| Pig iron, tons | 286,216 | 4,716,857 |
| | | 14,842,507 |
| Less value Ontario iron ore (120,177 tons) smelted into pig iron | | 282,702 |
| | | \$14,559,805 |

NON-METALLIC.

| | | |
|--|-------------|--------------|
| Arsenic, tons | 3,712 | \$ 2,782 |
| Brick (common) No. | 273,882,000 | 2,108,891 |
| Tile (drain), No. | 15,500,000 | 248,000 |
| Brick (pressed) No. | 69,763,423 | 648,683 |
| Brick (paving) No. | 3,732,220 | 73,270 |
| Building and crushed stone, tons | | 675,000 |
| Calcium carbide, tons | 2,667 | 173,763 |
| Cement, Portland, bbls. | 1,616,692 | 2,718,278 |
| Cement, natural rock, bbls. | 7,239 | 5,097 |
| Corundum, tons | 60,532 | 242,608 |
| Feldspar, tons | 12,328 | 30,375 |
| Graphite, tons | 2,000 | 20,000 |
| Gypsum, tons | 10,186 | 19,652 |
| Iron pyrites, tons | 15,755 | 51,842 |
| Lime, bush. | 2,649,143 | 423,863 |
| Mica, tons | 456 | 82,929 |
| Natural gas | | 756,174 |
| Peat, tons | 200 | 1,040 |
| Petroleum, Imp. galls. | 27,621,851 | 1,049,631 |
| Pottery | | 54,585 |
| Quartz, tons | 56,585 | 124,148 |
| Salt, tons | 48,735 | 379,771 |
| Sewer pipe | | 242,588 |
| Talc, tons | 1,870 | 5,010 |
| | | 10,137,970 |
| Add metallic production | | 14,559,805 |
| | | \$24,697,775 |

DOMINION COAL OUTPUTS FOR FEBRUARY, 1908.

| No. | Tons. |
|------------------|--------|
| No. 1 | 42,466 |
| No. 2 | 60,049 |
| No. 3 | 30,137 |
| No. 4 | 26,358 |
| No. 5 | 47,427 |
| No. 6 | 17,873 |
| No. 7 | 6,286 |
| No. 8 | 12,840 |
| No. 9 | 28,758 |
| No. 10 | 11,364 |

284,458

BRITISH COLUMBIA SHIPMENTS.

Following are the shipments for the week ending February 22nd and year to date:—

| | Week. | Year. |
|-------------------------------|--------|---------|
| Boundary shipments | 17,514 | 123,048 |
| Rossland shipments | 4,958 | 43,875 |
| Slocan-Kootenay shipments ... | 2,725 | 20,953 |

The total shipments for the past week were 25,197, and for the year to date 187,876 tons.

Nelson, Feb. 29.—The total shipments from Boundary and Kootenay mines for the past week were 30,186 tons, the largest for the present year so far. The total for the year to date is 218,502 tons. The various districts produced as under:—

| | Week. | Year. |
|-------------------------------|--------|---------|
| Boundary | 22,960 | 146,398 |
| Rossland | 4,924 | 48,799 |
| East of Columbia river | 2,302 | 23,305 |

Receipts at the various smelters were as follows:—Granby, week, 22,919; year, 145,967. Trail, week, 4,807; year, 45,438. Le Roi, week, 1,378; year, 14,790. Sullivan, week 675; year, 5,730. Total, week, 29,779; year, 211,925.

The output of the collieries of the Crow's Nest Pass Coal Company during the fourth week in February, for four years, compares as follows:—

| | Tons. | Daily aver. |
|------------|--------|-------------|
| 1908 | 22,776 | 3,796 |
| 1907 | 22,262 | 3,710 |
| 1906 | 19,769 | 3,295 |
| 1905 | 18,113 | 3,019 |

| | Week ending | |
|--------------------------|-------------|---------------|
| | Mar. 7. | Since Jan. 1. |
| | Ore in lbs. | Ore in lbs. |
| Buffalo | 301,100 | |
| Coniagas | 61,880 | 260,870 |
| Cobalt Lake | | 115,700 |
| City Cobalt | | 101,010 |
| Drummond | | 92,340 |
| Foster | | 168,600 |
| Kerr Lake | 61,700 | 144,290 |
| King Edward | | 127,240 |
| La Rose | 90,190 | 370,332 |
| McKinley | | 506,420 |
| Nipissing | 127,710 | 693,940 |
| Nova Scotia | 40,000 | 80,799 |
| O'Brien | 65,100 | 957,350 |
| Standard | | 39,730 |
| Silver Queen | 53,700 | 296,700 |
| Silver Cliff | | 52,000 |
| Silver Leaf | | 62,000 |
| Townsite | | 45,100 |
| Temiskaming | | 115,650 |
| Temiskaming & H. B. | 60,000 | 318,000 |
| Trethewey | | 177,116 |
| Watts | | 61,700 |

The total shipments for the week were 561,280 pounds, or 280 tons. The total shipments from January 1st to date, are 5,511,988 pounds, or 2,755 tons. The total shipments for the year 1907, were 28,081,010 pounds, or 14,040 tons. In 1904 the camp produced

158 tons, valued at \$136,217; in 1905, 2,144 tons, valued at \$1,473,196; in 1906, 5,129 tons, valued at \$3,900,000.

The output of the Crow's Nest Pass collieries for the week ending March 6th, compares with the same week in previous years, as follows:—

| | Week's output. | Daily average. |
|------------|----------------|----------------|
| 1908 | 20,075 | 3,346 |
| 1907 | 22,485 | 3,749 |
| 1906 | 19,429 | 3,328 |
| 1905 | 18,830 | 2,356 |

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

Gold production of the Transvaal mines last month, estimated by Kaffir houses in London, was 550,00 ounces, fine, comparing with 560,329 ounces officially reported for January. February had two working days less than the month before.

Value of the February output, calculated on the basis of the above estimate, compares as follows:—

| | |
|-----------------------|--------------|
| February, 1908 | \$11,687,000 |
| January, 1908 | 11,900,000 |
| December, 1907 | 12,393,000 |
| November, 1907 | 11,677,000 |
| September, 1907 | 11,427,000 |
| February, 1907 | 10,482,000 |
| February, 1906 | 8,658,000 |
| February, 1905 | 7,726,000 |
| February, 1904 | 6,149,000 |
| February, 1903 | 4,174,000 |
| February, 1902 | 2,728,000 |

MARKET NOTES.

Canadian Pig Iron.—For pig iron there is very fair enquiry, with the two largest Canadian producers reported as doing some cutting, and prices tend casiness. Domestic brands are quoted at about \$20, best grades of Scotch at \$22 to \$22.25, for Spring delivery, and No. 3 English, at about \$18.

The Londonderry furnace is blown out, owing to some difficulty over the coke supply. Domestic bars are easy at \$1.90, and there appears to be some lack of firmness in general iron products.

Silver.—February 20th, 56 1-4; February 21st, 55 7-8; February 24th, 55 5-8; February 25th, 55 7-8; February 26th, 55 5-8; February 27th, 55 1-4; February 28th, 55 1-4; February 29th, 55 3-8; March 2nd, 55 7-8; March 3rd, 55 3-8; March 4th, 55 1-4.

At a meeting of the McKinley-Darragh-Savage Mines of Cobalt, Limited, held in Toronto March 5th, a new board of directors was appointed, as follows:—

H. W. Sibley, Thomas Finucane, Joseph S. Hunn, and W. L. Thompson, of Rochester; C. A. Masten, Toronto; E. W. Stratman and L. J. Angevine, of New York.

Mr. Masten declined the office of the presidency in the absence in Europe of Mr. F. B. Chapin, who at present holds the office.