

# THE CANADIAN MINING JOURNAL

VOL. XXIX.

TORONTO and MONTREAL, July 15, 1908

No. 14

## The Canadian Mining Journal

With which is incorporated the  
"CANADIAN MINING REVIEW"

Devoted to Mining, Metallurgy and Allied Industries in Canada

Published fortnightly by the

**MINES PUBLISHING CO., LIMITED**

*Head Office* - Confederation Life Building, Toronto.  
*Branch Offices* Montreal, Halifax, Victoria, and London, Eng.

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

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

### CIRCULATION.

During the year ending with March 1st, 1908, 91,750 copies of "The Canadian Mining Journal" were printed and distributed, an average of 3,822 per issue.

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

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## COAL AND STEEL.

The president and directors of the Dominion Iron & Steel Company, at the recent annual meeting in Montreal, decided to reject the offer made by the Dominion Coal Company. That offer appeared to us reasonable and generous. In the event of the Dominion Coal Company winning before the Privy Council the Steel Company was to receive \$1,250,000.

If the Steel Company won, \$2,000,000 would be put in its coffers. The future price of slack coal was fixed at \$1.50 per ton and run-of-mine at \$1.80.

There is little need of reviewing the history of the struggle between these corporations. Until lately hope of a peaceful settlement has not been abandoned. Popular sympathy was undoubtedly with the Dominion Iron & Steel Company during the first stages of the conflict. Its decisive victories over its formidable antagonist were looked upon by not a few as being in accordance with justice. But in our opinion, there has been a dangerous element of sentimentality in the attitude of the public; and this attitude has not been without its influence upon the decision of the courts.

However, regarding all but the immediate past as a closed book, the fact obtrudes itself that all advances have come from the Dominion Coal Company. Its recent offer of a compromise stands in remarkable contrast to its attitude when the trouble first arose. We do not doubt that its directors, in consenting to make such a proposal to their opponent, have disregarded their personal animus and have sacrificed the interests of their own corporation to an extent that indicates an honest desire for peace. Therefore we mark with regret a certain resolute hostility that characterizes the utterances of the President of the Dominion Iron & Steel Company. The time for this has passed. On both sides sacrifices must be made. A sweeping legal victory for either side might easily resolve itself into an industrial catastrophe.

We have yet to learn what reasonable concession Dominion Steel is willing to make. So far the concessions have come from one side only.

## UNFINISHED BUSINESS.

Last March at its annual meeting in Ottawa, two topics of especial importance were discussed by the Canadian Mining Institute, and two resolutions, embodying the sense of the Institute, were passed unanimously.

The former of these resolutions had to do with methods of collecting mining statistics.

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The collection of mining statistics is, in itself, beset with many complications and hindrances. There is no law compelling mining or smelting companies to make sworn returns to the statistician of the Federal Department of Mines and that official must rely upon the courtesy of his correspondents.

Operators are under legal obligation, however, to furnish all necessary returns to provincial authorities. At first glance it might be concluded that this is sufficient for all purposes. Such, however, is far from being the case.

For instance, each province has its own method of computing the value of mineral outputs and each differs from the plan followed at Ottawa. Moreover the schedule of questions varies in each case. To add to the difficulties that confound the Dominion statistician, whose task of co-ordinating and standardizing would be a heavy one at best, provincial returns are further complicated by the fact that the official year is not identical in each province. Hence, complete returns are obtained only with disproportionate labor and worry.

The desirability of establishing uniform systems both of evaluation of raw materials, and intermediate and finished products, and also of an agreement whereby throughout the several provinces and at Ottawa, returns may be had in their entirety at the end of the calendar year, needs no argument. At present the apparent discrepancies between provincial and federal statistics is a source of confusion. The Canadian Mining Institute has taken the matter up. It has recommended "that a conference be arranged between the Deputy Minister of Mines and the Deputy Ministers of the Provincial Bureaus to devise, if possible, an uniform method of compiling statistics and valuing mineral products."

The matter must not rest here. By passing the above resolution the Institute recognized officially the need of reform. It has put its hand to the plow and there will be loss of dignity and prestige in failure to carry the movement to a successful conclusion.

Another subject, quite different in its bearing from that touched on above, but of at least equal interest, was brought before the Institute by Mr. J. B. Tyrrell. Mr. Tyrrell's resolution, seconded by Dr. T. L. Walker, read as follows: "Resolved—that the Canadian Mining Institute ask the various railways in Canada to issue tickets to prospectors at reduced rates, similar to the tickets now sold to home seekers; the records of such tickets to be endorsed on the Miners' Licenses held by such prospectors." This met the full and hearty approval of the Institute and was passed unanimously. It is a well-conceived and practical means of assisting prospectors, and, hence, a definite step towards opening up new mineral territory.

It is not easy to conceive of two more useful directions of activity for the Canadian Mining Institute than

those outlined. Why then is no further action being taken? If the Institute is to fulfil its high mission, if it is to justify the liberal assistance heretofore granted it by Federal and Provincial Governments, it must accomplish more than mere resolutions. To this end active committees are needed to co-operate with the secretary and council. And, were the members of these committees selected carefully, we have no doubt that the objects of both resolutions would be attained in a surprisingly short time.

#### CORRELATION OF INTERNATIONAL STRATA.

Mr. Horace F. Evans has recently contributed two articles to the Mining World of Chicago, on the subject of the correlation of international strata. Mr. Evans' treatment of his theme is popular. He sketches the work performed by the International Committee and assumes a judicial attitude in summing up results. By implication and by direct statement he asserts that the Canadian Geological Survey has neglected paleontologic investigation of the older strata of Southern British Columbia. The prediction is made that "exact correlations" of these strata will be accomplished by United States geologists in Northern Washington. "The paleontologist and the paleobotanist cannot expect to find much favor with colonial governments that have 'millions for tribute' but only a few thousands for economic science!"

It is evident from all this (and more that we have neither the time nor the patience to quote) that Mr. Evans has failed to fortify himself with facts. Nor is he conversant with the range and the character of the labors of the Canadian Survey.

The distinguished heads of the Canadian Survey had clear and correct conceptions of correlation. At present the Survey is co-operating with the United States geologists. In British Columbia work was begun long before that country was penetrated by a railway. Ever since that time paleontologic research has been carried on and each year has seen an increasing volume performed.

Dr. Dawson's first efforts were entirely confined to reconnaissance. He then chose certain districts for detailed examination. Where fossils were found successful correlation resulted. In disturbed regions, where the search for fossils was unsuccessful, final correlation was naturally impossible.

Of late the Survey has paid especial attention to the mining districts. Organic remains are not found here. But the investigation of the geologic phenomena of these regions is of prime importance to the province. No one, for instance, can deny the benefits accruing to the mining industry from the Survey's efforts in the Boundary district. But, since fossils are not to be found, why send a paleontologist to search for them? Mr. Evans' position is not sweetly reasonable.



On the other hand the Canadian Survey has seized with avidity any evidence of fossil-bearing strata in British Columbia and has in all cases dispatched paleontologists to hunt and collect over promising ground.

Mr. Evans aspersion on the "Colonial" (meaning "Canadian") Government is torrid atmosphere. The Canadian Geological Survey should, doubtless, be more liberally supported.

But, in proportion to their respective mineral industries, Canada appropriates just three times as much money as does the United States. Moreover, although working on a smaller scale, the Canadian Geological Survey has done incomparably more towards the correlation of international and western strata than has the United States Survey with its large staff and its heavy appropriations. Mr. Evans can hardly ask for more than this. Meanwhile we must thank him for giving us an opportunity to blow our own "National" horn.

#### DISCOVERY BEFORE LOCATION.

Dr. Raymond's vigorous article in our issue of June 15th has evoked much comment. On another page we print a communication from Mr. W. T. Newman, who concurs almost wholly with Dr. Raymond's position. Mr. Newman condemns the Ontario system of claim inspection as being apt to "lead to grave abuse" and as "an interference of a paternal nature with the search by the public for mineral wealth." He concludes that the vital point is uniformity—one law applying equally to all locations and covering essential revenue and a definite amount of actual exploratory work to be performed annually. Beyond that Mr. Newman's only plea is "let us alone."

It will be appropriate now to hear some voices from Cobalt and beyond. We shall welcome letters from our readers in the bush—from the men who are "up against it."

#### STANDARDIZATION.

A month ago we reprinted, for the benefit of our readers, the question-forms circulated by the Institution of Mining and Metallurgy. We have been encouraged by a letter from the Secretary of the Institution to urge Canadian mining men to submit answers to these question.

We wish again to request that our readers go carefully over these schedules and send us their opinions for publication. In our next issue we shall publish one set of answers already received.

Standardization is a particularly live and important topic, and it is both courteous and liberal on the part of the Institution of Mining and Metallurgy to offer non-members an opportunity of expressing their opinions.

#### THE MINING AND METALLURGICAL SOCIETY OF AMERICA.

As the result of vigorous canvassing, discussion and argument, the Mining and Metallurgical Society of America has been launched. Amongst its 114 charter members are many of the most distinguished engineers, metallurgists and geologists on the continent. On the printed list only two Canadian names appear, and these are the only foreign addresses included. Hence the new society is hardly cosmopolitan in its present scope.

That useful body, the American Institute of Mining Engineers, has long been regarded as meeting all the requirements of the mining fraternity. But it has been recognized that the Institute is incapable of performing certain necessary functions. For instance, it cannot take any part in watching and controlling legislation. Nor does membership imply technical attainments or professional standing. But the American Institute of Mining Engineers has exercised a wholesome and uplifting influence upon the mining fraternity of its own and other countries.

Yet more remains to be done. The Mining and Metallurgical Society of America is a strictly professional society. Membership in its is limited to the ranks of the mining and metallurgical engineers, and mining geologists. Whilst a high standard of professional ability and personal character will be insisted upon, yet membership is understood not to be an unqualified endorsement.

One proposal is to print brief records of the professional careers of each member. This thoroughly radical step will no doubt has a beneficent effect.

The five principal fields of activity are briefly as follows:

1. The establishment of local sections, meeting probably once a month, to promote good-fellowship among the members and to exchange views respecting technical and professional matters.
2. The determination of standards in engineering practice, such as is being done by the Institution of Mining and Metallurgy. This is considered a most profitable field of work.
3. The discussion of questions relating to professional practice and ethics, with a view to the gradual formulation of rules for guidance, determined by the concensus of opinion in the Society.
4. The discussion of questions of public policy in which the profession of mining engineering is directly concerned.
5. It is intended that the Mining and Metallurgical Society of America shall be a strictly professional society, etc., etc. This section we have touched upon already.

It will be in the directions defined in sections 3, and 4, that the distinctive work of the new society will lie.



In neither direction will there be serious overlapping of the field honorably occupied by the American Institute of Mining Engineers. In fact, to be useful at all, the Mining and Metallurgical Society of America must avoid duplicating the functions of its older sister. Another and less obvious danger lies in the abuses of power that characterize all close corporations.

Canadian mining men will watch with interest the growth of this fledgling. Meanwhile it is satisfactory to reflect that our own Canadian Mining Institute, whatever its deficiencies, has won its spurs. Its scope is wide enough, and its character sufficiently flexible to enable it to adjust itself to whatever contingencies arise. However, the time may soon be ripe for classification and segregation of its heterogeneous membership. When this is accomplished, Canadians will have the advantage of combining in one society all the advantageous features that mark its several sister organizations.

#### Editorial Notes.

The Mexican Mining Journal announces that Mr. Kirby Thomas, of Denver, Colo., for some years associate editor of the Mining World has taken full charge of the editorial management of the Journal. Mr. Thomas edited the two special Mexican editions of the Mining World. He is thoroughly familiar with Mexican mining and is well fitted to assume the editorship of our bright contemporary.

The Minister of Finance has given notice of a resolution that will have an important bearing upon the production of petroleum from bituminous shales. It is proposed to provide a bounty of one-half cent per imperial gallon on crude petroleum produced from shales or other substances mined in Canada. This places these products in the same category as petroleum obtained from flowing wells.

## DISCOVERY BEFORE LOCATION.

Written for "The Canadian Mining Journal" by W.  
Thos. Newman.

[Editor's Note.—The following typographical errors occurred in Dr. Raymond's article on the subject of "Discovery Before Location." We take this opportunity of making the necessary corrections, so that all ambiguity may be cleared away. Mr. Newman's contribution to the discussion presents a British Columbia point of view.

The errors referred to in Dr. Raymond's paper are:

1. First column of article, third line, the word "solid" should be "valid."
2. Same column, fifteenth line from bottom, the word "location" should be "locators."
3. Second column, third line from bottom of first paragraph, "land" should be "lands."
4. Second column, second line of second paragraph, "indefeasable" should be "indefeasible."
5. Second column, eighth line from bottom, "If he could sell it" should be "If he could not sell it."]

Answering your request for further discussion of the above subject, after reading Dr. Raymond's interesting paper in the last edition of the "Journal," I would remark:

The actual discovery of mineral of commercial value if properly conditioned should be the "sine qua non" of the granting to an individual a portion of the public domain, as it undoubtedly is the one and only inducement for the exploitation of the same and its conversion from a useless portion to one of both public and private value. This is I consider a demonstrable proposition, and therefore the "modus operandi" is the real question at issue. It is acknowledged by all of the men with whom my mining business in British Columbia brings me in contact, that British Columbia titles to lode mining ground are the best in their experience.

If the supreme test be that of validity then the very few law suits over titles in this province compared with other countries would seem good evidence of the fact. Clause "28" of the "Mineral Act" quoted below, may also be useful to any seeker after information on the subject of land titles. It is worthy of some thought and reads: "Upon any dispute as to the title of any mineral claim no irregularity happening previous to the date of record of the last certificate of work shall affect the title thereto, and it shall be assumed that up to that date the title to such claim was perfect, except upon suit by the Attorney-General based upon fraud." It is especially significant that there is no precedent for a suit by the Attorney-General under this clause. British Columbia mining titles are absolutely secure.

In, I think, 1898, the writer was on a committee appointed at the request of the Government to suggest any possible alterations to the Mineral Act, and one of the two or three ideas suggested bears very closely on the matter under review. This was "that all applicants for a record of a mineral location should be required to bring into the recorder's office two fair cabinet size samples of the mineral found at his discovery post and make affidavit that the samples were found 'in situ' at that point." One of these samples properly labelled was to remain in the local office and the other to be placed in the Museum at Victoria in the Department of Mines. It would seem that such provision should for all time settle the fact of actual discovery or non-discovery on such location. Also the Government would, as pointed out, in a few years have a collection costing nothing, every sample sworn to have come from a given location, and containing such a collection, as it would be impossible to get together in any other manner. Given the above addition to the present mode of staking mineral loca-



tions in British Columbia and the present law would appear about as perfect as it could be made. The Ontario method of having an inspection made by a government official, whether competent or not, is bound to lead to grave abuse and is an interference of a paternal nature with the search by the public for mineral wealth which will not attract the best class of prospectors to what is undoubtedly a rich field and one where the natural difficulties are unusually great, constituting quite sufficient handicap to the individual prospector who is the real explorer and on whom the province must perforce rely, if the "back of beyond" is to become the real producer of wealth in that great country. The last recommendation in that committee's report was "let us alone" and this to-day is perhaps

the greatest need of most countries where adequate mining laws are in force. It is true that there are some countries on this continent still which have never had any real mining laws. With arguments in the able paper quoted by Dr. Raymond other than the doubt as to "bona fide" discovery being a good thing, I am in full accord. Allow any man or men to take up just as many claims as the annual assessment is faithfully performed upon and no more, and both the prospector and the capitalist will have ample opportunity to secure whatever they may deem desirable. The one point is—uniformity. Have one law applying equally to all locations covering essential revenue and a certain amount of real exploring of the ground annually and then "let us alone."

## VALUATION OF MINING PROPERTIES.

By George H. Gillespie, M.E.

The valuation of mining properties for operation and profit earning should always be looked upon from a commercial point of view. The engineer or valuer must, therefore, always keep before him this question: If I buy this mining property for a given price, spend a certain sum on plant, development and equipment, will the probable output from this mine return such expenditures, plus a reasonable return on capital so expended, commensurate with the risk undergone?

It is not claimed or expected that all mining properties can or should be purchased as certainties. The purchase price of a speculative venture should surely, however, bear some reasonable relation to the possible profit to be earned from successful operation.

Great stress is often laid upon the phenomenal success resulting from the operation of certain properties, properties that at earlier stages may have shown or (more correctly) it may have been claimed that they showed little or no evidence of their great productive future. It is again often claimed, usually by interested parties, that many good properties have been turned down by the trained valuer, which later on made good. It is certain that the trained and experienced observer does make mistakes, but it is equally certain that he makes fewer mistakes than the untrained man.

The critic of the trained mining valuer, when he cites the case of the mine that made good after it had been turned down by the valuer, usually omits to mention, and is often ignorant of, the reasons on which the opinion had been based. It may be that the property was worth a price, but not the price at which it was open for consideration. Many reasons might be given to show why a property turned down at one time might later on, under changed conditions, become valuable.

The problems of mine valuation may be divided roughly into two classes: (1) Mining prospects on which no work of determinative ore blocking has been done, but work of a merely indicative nature. (2) Mining properties on which actual ore reserves have been blocked out, the ideal case being a mine which has a past, a present, and a future, viz., past production, actual present operation, and the certainty of future profitable or positive ore reserves.

The valuation of the first class of mining properties is attended by a great deal of risk. The risk may be minimized by comparison with similar conditions,

known to exist elsewhere. Should the prospect be situated in a district that has had large development of similar claims, great aid may be derived from a consideration of conditions found at various stages of development in such claims, and comparison with conditions at similar stages found in the prospect to be valued. That is, the study of the mining history of any given district should prove of positive assistance to the valuer.

The highest probable value of any mining prospect in a given district may be approximately stated to be the average value of successes in that district, successes being taken to mean such mines as may have been actually worked as paying propositions. Exceptions will, of course, be found to a general rule such as this. Mines vary in value, as do other things. There will always be the best and the worst mine. However, as a basis of valuation a rule such as this should prove valuable. If a district is a new one, or an old district in which little or no great success has been met with in actual practice, even should indications on a given claim appear to be exceptional, a small valuation would be justified.

The valuer must be willing to take a fair risk, his duty being to look for merit and business opportunity, not simply to condemn.

The valuation of producing mining properties is the problem that comes more nearly into the province of true engineering. In a producing mine data can be collected which when correlated should give a foundation for actual calculation of values.

I shall divide producing properties into two classes, based upon the nature of the valuable contents of the ores: (1) Ore values that are not subject to market fluctuations, such as gold. (2) Ore values that are subject to market fluctuations, such as silver, copper, lead, etc.

It must be manifest that a property whose payable probabilities are based on ores of metals whose selling price fluctuates over a wide range must be valued on the average probable price of such metals during a reasonable assumed lifetime of the property.

The engineer is therefore called upon not merely to value from a geological standpoint, but he must consider the commercial and metallurgical factors. By his knowledge of geological and mining conditions, he



can arrive at his estimate of the lifetime of the mine, and by his commercial and metallurgical knowledge at the value of the mine.

He must be able to estimate the ore actually in sight by the usual methods of sampling, and he should be able to cost the ore through to the market. The value of an ore to a mining company is that profit, if any, that can be earned from mining and treating the ore, and marketing the product of these operations.

The question confronting the mine valuer or buyer is the usual commercial one faced by the buyer of dry goods or other merchandise: What is the fair price to me, that is the price at which I can buy, operate, and make a profit? And mining differs from no other business in that the object of conducting mining operations is the earning of profit. If the initial mistake of paying too much for the property is made, then the venture is foredoomed to failure. A mine has an absolute value. It may be difficult to determine that value at the early stages of operation; but the value is, however, absolute, no matter how obscured.

The ore reserves in mines other than gold mines, that had been valued on market values of a year ago, would, on the same ore reserves be to-day worth as a result of market fluctuations about 20 per cent. less. In addition to this direct result of the falling prices of metals, a mine's value is affected in another way. The falling prices of metals mean that the market is less able to buy, and that a mine will therefore probably be forced to reduce materially its output on account of the inability of the market to take care of such output.

Should the financial condition of the mine warrant it, during low markets, to prevent over-production of metals, it might well be that the cheapest storage of metal is in the stopes of the mines as unbroken ore. Initial over-capitalization and over-valuation may force production and operation at periods of low-priced metals, when it had been better policy to have temporarily suspended or reduced operations. A mine really contains just so many ounces, pounds, or tons of valuable contents, and when these are sold at low figures there is just so much less to sell at the high figures. In largely developed mines production averages may be maintained by working low grade ores during high priced metal markets, and high grade ores during low priced markets.

The valuer of a mine is faced with that distinctive feature of mining, the fact that the miner destroys his assets to earn his profits. Each ton of ore produced is one ton nearer the working out of the mine, and a ton that cannot be replaced. That is, in a given area there is a certain quantity of ore—that, and no more. Therefore capital investment must be based upon the return of this capital in the period of time in which this ore body will be exhausted. Dividends from a mine are rarely income, but must be looked upon as being income plus redemption of capital. The lifetime of a mine is therefore an important factor of mine valuation.

The costing of mining operations for valuation of ore reserves can only be done by a man familiar with actual mining operations. The cost per ton is often stated as a figure that looks reasonable. If one takes the result of a year's operation on a mining property, multiplies the tonnage by the tabulated costs per ton, and subtracts the product from the gross value of the output, the result would appear to be the profit per ton. However, the actual net profits are very different, and

are always much less. One is therefore forced to the conclusion that the actual cost per ton is the difference between actual profits and gross value of the ore, and that tabulated results obtained from many cost systems are merely book-keeping. In my opinion the only true basis for tabulating comparative costs for valuation of ore reserves is the cost of production of unit in values in the ore, say the ounce for gold and silver taken as refined, or the pound for copper, the total cost per unit being the actual cost to market, the profit per unit being that profit earned after total cost has been deducted.

The advance of the cost per unit of value as against cost per ton of crude may be illustrated in the valuing of gold mines. I will take the case of small vein as against a large ore body.

I will suppose that the character of ore in both cases is similar. Costs stated are arbitrary, but the ratio of operative costs is fair.

Small vein, 2 feet, 1 oz. per ton gold values.

Large vein, 30 feet, \$3 per ton gold values.

1 ton, 2 foot vein = 1 oz.

7 tons, 30 foot vein = 1 oz.

Cost per ton, 2 foot vein = \$10 per ton, mining, milling, etc.

Cost per ton, 30 foot vein, = \$2 per ton, mining, milling, etc.

Cost, per oz., 2 foot vein = \$10 per oz.

Cost per oz., 30 foot vein = \$14 per oz.

Profit per oz., 2 foot vein, \$10 per oz.

Profit per oz., 30 foot vein, \$6.

The two foot vein, 1 oz. per ton, proposition would call for a small initial installation of plant, say 20 stamps, with corresponding equipment and development. The 30 foot ore body, \$3 per ton, would require a comparatively large installation, say 100 to 200 stamps, with proportionate equipment and development, involving a large initial expenditure of capital; the 2 foot vein gives good returns on small initial expenditures. The 30 foot low grade ore body means a large initial expenditure and large scale of operations before any corresponding return can be looked for. The scale of operation of a property is, therefore, an essential factor in its valuation.

Each class of mining venture is a good one, provided it embodies the necessary features for successful operation called for by the limitations of its class.

The small body can be more easily valued; the larger body calls for a careful preliminary sampling, first by ordinary methods of hand sampling, later by operation on a small scale. Successful operations of large low grade ore bodies are more often the result of careful evolution in mining and treatment practice over long periods of time, than the endeavor to earn profits on economies at the start of operations. The ideal conditions for a future large low grade producer are the existence of fair quantities of good grade ore associated with large quantities of low grade ore. The mine can be opened up on the high grades, on a small scale, the initial mistakes made on a small scale, and on a grade of ore that can best afford to pay for such mistakes. Gradually the scale of operations can be extended to that point where the largest quantity of ore of lowest payable grade can be worked. It is always a dangerous method to endeavor to create large operations where there is nothing but low grade ore.

(To be continued)



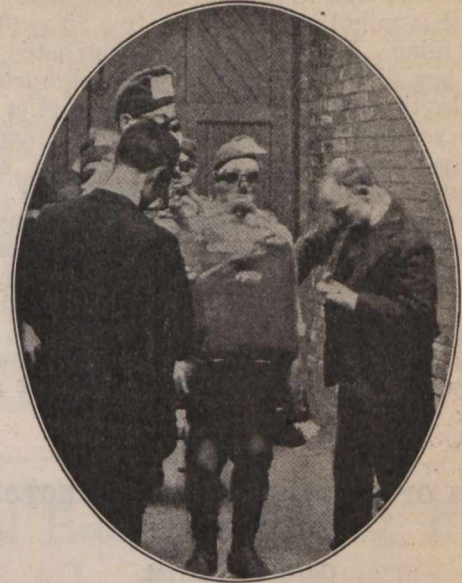
# A SCHOOL FOR RESCUE WORK IN COAL MINES.

"The Canadian Mining Journal" has given prominence to articles on rescue work in coal mines. The vital necessity of properly equipped stations and of facilities for instructing miners in the use of breathing apparatus may be emphasized at any moment by shock-

ing calamities. In all Canada there is only one station where breathing apparatus is kept in readiness for emergencies and where men are trained to meet these emergencies. That station was built and equipped at Glace Bay, Nova Scotia, by the Dominion Coal Com-



"AEROLITH" APPARATUS.



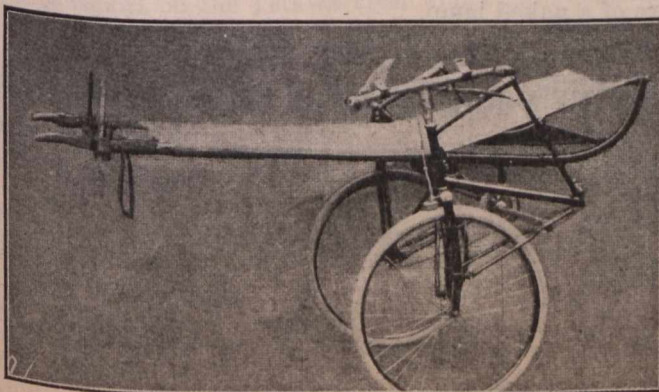
DOCTOR EXAMINING TEAM BEFORE ENTERING THE MINE.



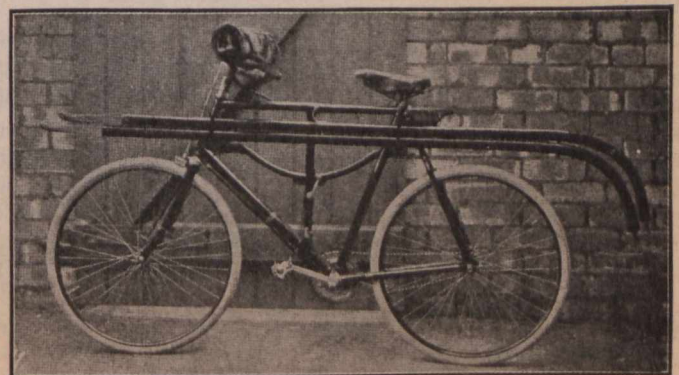
THE WEG APPARATUS, SHOWING CYLINDER.



THE WEG APPARATUS, FRONT VIEW.



CYCLE AMBULANCE.



SIMONS' AMBULANCE CYCLE—It can be fitted as an ambulance in three minutes.



pany. Not only is it the sole establishment in Canada, but, strange to relate, there is no other in all America.

At Glace Bay the Draegar apparatus is in use. We reproduce here another type of apparatus, the "Aerolith."

At Atherton, Lancashire, England, an elaborate model mine has been constructed by the Lancashire & Cheshire Coal Owners' Association. Here novices are trained to meet and overcome the difficulties and obstruction that might be expected after an explosion in an actual mine. The galleries are obstructed and the workings are filled with smoke and sulphuretted hydrogen. In these galleries competing parties of miners set up ventilation walls, remove debris, carry dummies and perform all the duties that they would be called upon to meet in times of real danger. Judges watch the competitors through glass partitions.

The photographs here reproduced are of particular interest. It is not too much to say that our larger mining schools should add a practical course in the use of breathing apparatus to their curricula. No colliery manager's education should be considered complete if it does not include a working knowledge of this subject.

## REPORTS OF BRITISH MINES INSPECTORS FOR 1907.

### Cardiff District.

The Mines Inspector's report states that 96,265 persons were employed above and below ground at the mines during 1907. Thirteen thousand six hundred and thirty-four of this number were employed overground. The improved price of coal brought about three increases in the miners' wages, which now stand at the maximum of 60 per cent. above the standard of 1879. Twenty-four million six hundred and twenty-five thousand seven hundred and twenty tons of coal, 44,166 tons of fireclay, and 8,195 tons of ironstone were raised. Taking all these into the calculation, 298.6 tons of mineral were raised for each person employed below ground. For each person employed above and below ground, 256.3 tons were raised. The production per person was lower than in any previous year.

One hundred and sixteen thousand four hundred and eighty-four tons of coal were produced by coal cutting machines, whilst in the previous year only 64,135 tons were won by this means. In two cases narrow seams, unworkable by hand, were worked successfully by machines. A total of 17 machines was used, 3 driven by electricity, 14 by compressed air. Ten of these were bar machines, three percussion, three disc, and one chain.

The number of deaths due to accidents amounted to 138. Falls of roof or wall were responsible for 65 deaths; miscellaneous underground accidents, for 50 deaths. In addition to this, 259 persons were injured in the former class of accidents and 210 in the latter. The death rate from accidents per 1,000 persons employed below ground was 1.524, as compared with 1.730 for the year 1906. Tons of mineral raised per life lost amounted to 178,835. In 1906 the figure was 159,879 tons per life lost.

The explosive most commonly used was Saxonite, of which 240,587 pounds were consumed. Out of the total estimated number of shots fired, 964,052, a large proportion, 902,640, were fired by electricity. These

figures included only permitted explosives. Gelignite and gunpowder, not on the list, were used to the extent of 120,499 pounds.

In the Cardiff District 89,938 safety lamps were in use. The lead rivet method of locking was used in 52,064 of these lamps and the magnetic on 29,775. The Clanny lamp (shielded, one gauze) constituted a large proportion of the total—84,689.

### Swansea District.

As in Cardiff, the relations between employers and employed were uniformly pleasant throughout the year. In neither district was there any serious stoppage of work due to friction between operators and miners.

At 292 coal mines, 47,179 persons were employed, an increase over 1906 of 5,813. Overground there were 8,459 persons, underground 38,120 persons employed. Twelve million one hundred and fifty-six thousand seven hundred and eighty-eight tons of coal were raised, an average of 1,101,687 tons over 1906. The output of anthracite was 3,498,258 tons, 456,042 tons greater than the previous year's figure.

Forty-nine thousand and seventy-six tons of coal were won by coal cutting machines, as compared with 12,113 tons in 1906. Eleven machines were used, six of which were bar machines. Six were actuated by electricity, five by compressed air.

The deaths from accidents numbered 110, as against 74 in the year preceding. This large increase was due to explosions of firedamp or coal dust, falls of roof and sides, and miscellaneous accidents. The mines were worked under extraordinary pressure. The large number of non-fatal accidents, 458, may be explained by the fact that the new act has the effect of inducing managers to report accidents of a very slight character. Out of the 110 deaths, 42 were attributable to falls of roof or sides. The death rate from accidents underground was 2.66 per 1,000 persons employed.

Saxonite (290,029 pounds) was the most widely used explosive, with Bobbinite (177,084 pounds) second. Gunpowder had 378,892 pounds to its credit, but is not included in the permitted list. Seven hundred and seventy-one thousand and thirty-seven shots out of 1,579,439, were fired by electricity.

The Cambrian (Clanny type) safety lamp is in use more than any other type. The total number of lamps is 26,310, and of these the Cambrian numbers 16,525. 95.5 per cent. of the safety lamps are locked by methods other than the screw method. With the exception of the Protector (6,028 in use) and the Ackroyd and Best (2,445 in use), which are relighted by electricity, the lamps are relighted at lamp station by the exposure of a naked lamp.

## NEW MEMBERS CANADIAN MINING INSTITUTE.

The following gentlemen have been elected members or associate members since the annual meeting, March, 1908:

March 3rd, Members—Manley B. Baker, School of Mining, Kingston, Ont.; John Chas. Dufresne, Riondel, B.C.; Geo. Gillespie, 411 Continental Life Bldg., Toronto, Ont.; A. Heathcote, Inspector Mines, Lethbridge, Alta.; Norman L. Leach, Moose Mountain Ltd., Sudbury, Ont. Associates—D. A. Brebner, 1428 Traders Bank Bldg., Toronto, Ont.; J. E. Cook, Temple Bldg., Toronto, Ont.; Jas. McGregor, Latchford, Ont.



March 7th, Members—Thos. Travers, Sudbury, Ont.; J. E. Woodman, D.Sc., Dalhousie University, Halifax, N.S. Associate—Wm. C. Chambers, Harriston, Ont.

April 1st, Members—James Anderson, Ruth Mines, Box 122, Kaslo, B.C.; S. R. Heakes, Supt. Kerr Lake Mining Company, Cobalt, Ont.; J. H. Hubbell, manager Silver Bar Mining Company, Cobalt, Ont.; Lieut. Col. H. H. Williams, C.E., general manager Broughton Asbestos Fibre Company, East Broughton Station, Que. Associates—Frank L. Cody, managing director Cleveland Cobalt Silver Mines, Limited, Box 179, Cobalt, Ont.; Herman H. Lang, mine manager, Cobalt, Ont.; J. Lorne McDougall, jr., Haileybury, Ont.; A. J. McMillan, general manager Le Roi Mining Company, Limited, Rossland, B.C.; Robert Meredith, Box 722, Montreal, Que.; Clive Pringle, Ottawa, Ont.; Arthur Ross, Box 1122, Montreal, Que.; Geo. E. Sancton, Box 136, Cobalt, Ont. Student—B. Neilly, Bradford, Ont.

May 2nd, Members—H. S. Badger, M.E., Richardson Mines, N.S.; J. W. Bryant, M.E., Box 665, Victoria, B.C.; J. T. Fee, M.E., Cobalt, Ont.; Geo. L. Fraser, mine superintendent, Coleman, Alta.; B. W. Leyson, Cobalt, Ont.; G. F. McNaughton, Cobalt, Ont.; A. H. Sancton, M.E., care Mussens, Limited, Cobalt, Ont.; Bert N.

Sharp, M.E., Orient, Wash, U.S.A.; Robt. Turnbull, C.E., 23 Luke street, St. Catharines, Ont.; C. G. Williams, M.E., Cobalt, Ont. Associates—L. O. Armstrong, 221 Milton street, Montreal, Que.; Spencer Benerman, Midway, B. C.; C. L. Campbell, Box 85, Cobalt, Ont.; W. Teese Curran, mine owner, 300 St. James street, Montreal, Que.; E. L. Doucette, Room 53, 112 St. James street, Montreal, Que.; G. A. MacPherson, M.E., Niagara Falls; D. B. Rochester, Cobalt, Ont.; Robt. T. Walker, Cobalt, Ont.

June 28th, Members—Lyndon K. Armstrong, M.E., Spokane, Wash., U.S.A.; C. V. Brennan, B.Sc., Summerside, P. E. I.; G. H. Corbet, M.E., Phoenix, B.C.; Geo. H. Dickson, M.E., Coleman, Alta.; Dr. B. E. Fernow, University of Toronto, Toronto, Ont.; A. G. Larson, superintendent Le Roi Mining Company, Limited, Rossland, B.C.; Fred. S. Peters, Le Roi Mine, Mossland, B.C. Associates—L. C. Butler, president Slipp-Butler Company, 52 Wall street, New York, N.Y., U. S. A.; W. J. Hamilton, Deloro, Ont.; Arthur P. Naismith, Cobalt, Ont.; Samuel Price, St. Thomas, Ont.; Gordon McL. Pyke, Box 893 Montreal, Que.; W. S. Rugh, Le Roi Mining Company, Limited, Rossland, B.C.; R. P. Williams, Rossland, B.C.

## Notes on Reports and Maps of Special Economic Interest, Published by the Geological Survey Branch of the Department of Mines.

Economic Geology of Nanaimo and New Westminster Districts, B.C. (issued June, 1908).—Preliminary report on a portion of the main coast of British Columbia and adjacent islands, included in the New Westminster and Nanaimo districts, by O. E. Leroy. This report, while only preliminary, gives a fund of information respecting the economic geology of a portion of British Columbia which, though only partially examined, has already given evidence of being rich in mineral wealth, as well as possessed of immense timber resources, with water power available for their development. Gold, silver, copper, iron, zinc, structural stone in great variety, and clays—some of a very fine, pure character—are all found in abundance, as well as other minerals of lesser importance. An excellent map is incorporated in the report, thus adding practical importance to this publication.

Coal on the Telkwa River, B.C. (issued May, 1908).—A report on the Telkwa river and vicinity, by W. W. Leach, issued by the Geological Survey Branch of the Department of Mines, is of interest from the fact that extensive bodies of coal are known to exist along that river, and its tributary streams, which will be rendered accessible by the construction of the Grand Trunk Pacific Railway. At present, the only means of communication is by pack train; but as soon as the coast section of the Transcontinental Railway is opened, the coal can be shipped direct from the mines to tide water. The country has been only roughly prospected, but many mineral claims have already been staked, and much of the available arable and timber land taken up. A map accompanies the report.

Gold Near Lake Megantic, Que. (Issued June, 1908).—The report of John A. Dresser, on the recently dis-

covery of gold, near Lake Megantic, Quebec, issued by the Geological Survey Branch of the Department of Mines, recalls the fact that alluvial gold was successfully mined for many years on tributaries of the Chaudiere river, which flows out of Lake Megantic. The present discovery is near Victoria river, which empties into the lake. Three separate dikes have been located, in which quartz, carrying small grains of gold, is found. A considerable number of licenses have been taken up along the Victoria river, in the hope that alluvial gold may be found. An assay of a sample taken from one of the dikes shows, in addition to gold, a small silver value. The report is accompanied by a map.

Tertiary Plants of British Columbia. (Issued 1908).—This is a monograph on the tertiary plants, found in the lignites of British Columbia, and other portions of Western Canada, the material for which was collected by L. M. Lambe, in 1906, the determination of species having been made by Professor Penhallow, D.Sc., F. G. S. A., of McGill University, Montreal. Although much has been accomplished in determining the age of the tertiary deposits, it is still an open question as to the precise horizons within which they fall, and the number of successive stages represented in the tertiary as a whole. The studies contained in this report will help to clear up some of the questions about which there is difference of opinion; and the report brings together, in readily accessible form, a mass of material hitherto scattered and fragmentary.

Report on a Portion of Northwestern Ontario Traversed by the National Transcontinental Railway, Between Lake Nipigon and Sturgeon Lake. (Issued 1908).—The National Transcontinental Railway, now under construction, will open up and render accessible much



territory of which little has hitherto been known. This report describes a district to the north of Lake Superior, which the explorations made by the author—W. H. Collins—show to be possessed of considerable economic value. Gold and iron are the principal minerals—so far as known—and some development work has been done, though not to any great extent. This region, owing to its geological peculiarities, has many lakes and water courses, and water powers exist in every direction. Areas of arable land are to be found, together with an abundance of timber for firewood, and mining purposes. A map, geologically colored, showing the features of the district, accompanies the report.

Moose Mountain District of Southern Alberta. (Issued 1907)—The Moose Mountain district, in Southern Alberta, is rich in coal, and natural gas, and its frequent accompaniment, oil, are also found. This report, of investigations made by D. D. Cairnes, B.Sc., M.E., contains full information respecting the geology of the area, and the economic minerals it contains; with lists of the fossils and the flora there found. A map goes with the report.

Geological and Topographical Map of a Portion of Conrad and Whitehorse Mining District, Yukon Territory. (Issued 1908)—Considerable activity has been going on in the development of the district shown on this map, now rendered easy of access by means of the White Horse & Yukon Railway. The map shows the geological formation, topographical features and mining claims of the district. It has been prepared to accompany a report of D. D. Cairnes, B.Sc., M.E.

Elmsdale Sheet, Hants and Halifax Counties, Nova Scotia. (Issued 1908)—This map shows, in detail, all the features of this portion of the gold-bearing area of Nova Scotia. In addition to the map there is also a section indicating the respective rock formations. The map includes the Renfrew, Mount Uniacke, and Oldham gold districts.

Geological Map Showing Coal Areas in Alberta, Saskatchewan and Manitoba. (Issued 1907)—The coal supply for the western provinces is an economic question of great importance. This map, showing the coal areas, has been prepared to accompany a report by D. B. Dowling, B.A.Sc., and will be of great service in this important matter.

Map of the Auriferous Gravels on Bonanza and Hunter Creeks, Klondike Mining District, Yukon Territory. (Issued 1908)—This map has been prepared to accompany a report by R. G. McConnell, M.A., and conveys much information respecting a district to which much attention has been directed recently, on account of its rich gold mines.

Plan and Sections of the Brookfield Gold District, Queens County, Nova Scotia. (Issued 1908)—This plan, prepared by E. R. Faribault, B.A.Sc., shows one of the gold districts of Nova Scotia, which has yielded considerable quantities of the precious metal.

New Topographical Map of Rossland District, B.C.—Special map of Rossland, B.C., by W. H. Boyd. This map—issued June, 1908—shows the topography of the city and the adjacent mining districts, with contour lines, and details, which cannot fail to be of great service to anyone interested in the development of this important mining centre.

## GEOLOGICAL SURVEY PARTIES.

The interim supply bill passed last week has enabled the Geological Survey to get another group of parties into the field.

Mr. W. McInnes has left for South Indian Lake and the Churchill River. The possibility of this country being opened up by the Hudson's Bay Railway in the near future is attracting attention to this region. The upper and lower portions of the Churchill River have already been explored by the Geological Survey. Mr. McInnes will endeavor to fill in the gap now existing. He will try to get in by one route and return by another, to secure additional information as to the geological boundaries, and to examine reported coal and copper occurrences north of Prince Albert.

Mr. W. H. Collins has left for the Montreal River to study the economic geology of the region near its headwaters. The lower portion of the river received a good deal of attention last year from prospectors and promising discoveries were made. The upper portion of the river needs exploring.

Mr. W. A. Johnson has left for Simcoe, Ontario, to continue his topographical and geological work in this sheet covering this portion of the province.

Mr. M. E. Wilson has left for the district north of Lake Temiskaming, in the Province of Quebec. Prospecting for gold is going on in the neighborhood of Lake Opisatica and northeast from Larder Lake on the Quebec side.

Mr. J. A. Fraser is leaving to conduct a geological survey along the line of the national transcontinental from Quebec to the Quebec-New Brunswick interprovincial line.

Mr. G. A. Young has taken a party to New Brunswick to make a detailed survey of a geological sheet covering the iron range near Bathurst.

Mr. R. W. Eells has a party at work in Albert County mapping the oil shales which he will investigate as to their extent and their possibilities in producing petroleum. Dr. Eells is a present in Scotland for the Department of Mines, investigating the oil shale industry in the old country, where for many years it has been successfully conducted.

Mr. E. R. Faribault will be leaving Thursday for Nova Scotia to continue his mapping of the gold-bearing rocks of this province.

Mr. Hugh Fletcher will spend the field season in Cumberland County, Nova Scotia.

Experiments show that while the sedimentary rocks may absorb several per cent. of their volume of water—sandstones 15 per cent., limestones, 5 per cent. and shales 4 per cent.—granites and crystalline rocks seldom absorb more than one-half of one per cent. of their volume, and until within a few years it was thought to be absurd to sink a well in the harder rocks. Frederick G. Clapp, of the United States Geological Survey, has now reported that about 87 per cent. of the wells in granite in southern Maine supply water enough for domestic use. Water percolates very slowly through the rock but more sinks into the vertical joints, and a moderate quantity is stored in the horizontal joints and crevices down to a depth of 200 feet, the amount being so limited that only two out of 72 successful wells yielded more than 50 gallons per minute. The wells are drilled only in the surface rocks, two-thirds being not over 100 feet deep.



# THE CANADIAN MINING INSTITUTE SUMMER EXCURSION, 1908.

As previously announced, the Summer Excursion of the Institute will start from Quebec on August 24th.

The itinerary of the tour is as follows, subject to necessary revision en route:

## STAGE I.

**Monday, Aug. 24th.**—Members will assemble at the Chateau Frontenac in the city of Quebec. Visits will be made to the Island of Orleans and other points of interest. The train will leave for Sydney, N.S., late in the evening.

**Wednesday, Aug. 26th.**—Arrive at Sydney, N.S. (N.B. All arrangements in connection with Nova Scotia visit have been kindly undertaken by the Mining Society of Nova Scotia.)

**Thursday, Aug. 27th.**—Visit to the Dominion Iron & Steel Company's work.

**Friday, Aug. 28th.**—Visit to the Dominion Coal Company's collieries, etc. Banquet at Sydney. Late in the evening the train will leave for Stellarton.

**Saturday, Aug. 29th.**—The day will be spent in visiting the Acadia Coal Company's colliery at Stellarton. The train will leave the same evening for Sherbrooke, via St. John.

**Monday, Aug. 31st.**—Upon arrival at Sherbrooke early in the morning, the party will go by the Quebec Central Railway to Thetford, Que., where the day will be spent in visiting the asbestos mines in the neighborhood, and the Canadian Chrome Company's works at Black Lake.

**Tuesday, Sept. 1st.**—Arrive in Montreal about midday.

**Wednesday, Sept. 2nd.**—Excursions will be arranged and a reception given by the Local Committee. Leave for Toronto in the evening.

## STAGE II.

### Ontario Excursion.

**Thursday, Sept. 3rd.**—Arrive in Toronto in the morning and proceed at once to Niagara Falls, by steamer across Lake Ontario to Lewiston, and thence by Gorge Railway to the Falls, where the day will be spent.

**Friday, Sept. 4th.**—Leave Niagara. The day will be spent in Toronto, where the party will be the guests of the directors of the Toronto National Exhibition. The train will leave in the evening for North Bay and Cobalt.

**Saturday, Sept. 5th.**—Arrive at Cobalt early in the morning. The principal mines of the district will be visited, the arrangements being in the hands of the Cobalt Branch of the Institute.

**Sunday, Sept. 6th.**—Leave Cobalt and arrive Sudbury.

**Monday, Sept. 7th.**—A visit will be paid to the Moose Mountain iron mine.

**Tuesday, Sept. 8th.**—Arrive at Copper Cliff. The party will be the guests of the International Nickel Company, whose smelter and Creighton mine will be visited. The company has also kindly undertaken to provide a camp luncheon. Leave Sudbury at midnight.

## STAGE III.

### Alberta and British Columbia Excursion.

(N.B. The following programme is subject to minor alterations at the discretion of the Local Committees in charge of the entertainment arrangements at the different localities to be visited.)

**Thursday, Sept. 10th.**—Arrive Winnipeg 9.45 a.m. Leave Winnipeg 11.20 a.m.

**Friday, Sept. 11th.**—Arrive Medicine Hat in the morning, and visit natural gas wells. Leave by special train for Lethbridge, where the afternoon will be spent at the colliery of the Alberta Railway and Irrigation Company.

**Saturday, Sept. 12th.**—Arrive in Frank early in the morning, where a short stop will be made to enable the party to see the landslide and coal mine. Arrive before noon at Coleman, where the remainder of the day will be spent in inspecting the mines and plant of the International Coal & Coke Company. Special side excursions to Lille, Hillcrest and Bellevue collieries may be arranged by the Local Committee (the Lille mines are equipped with a new power and coal washing plant and the only set of Belgium ovens in the West).

**Sunday, Sept. 13th.**—Leave Coleman early in the morning, arriving at Hosmer about 9 o'clock. A short stay will be made here to enable the party to inspect the extensive and thoroughly modern colliery established at this point by the C. P. R. After arriving at Fernie early in the afternoon, the train will immediately leave for a visit to the mines at Coal Creek. Leave Fernie at midnight for Moyie.

**Monday, Sept. 14th.**—The train will arrive at Moyie at 6 a.m., and the morning will be spent in inspecting the St. Eugene (the largest silver-lead mine in Canada) and concentrator. The train will leave at midday to connect with the steamer leaving Kootenay Landing, and arriving at Nelson at 7 p.m.

**Tuesday, Sept. 15th.**—Leave Nelson at 6.30 a.m. by special train, and arrive at Smelter Junction at 8.30 a.m. Here the party will be permitted to inspect the well-equipped smelter and refinery plant of the Consolidated Mining & Smelting Company of Canada, Limited. The remainder of the day will be spent at Rossland and visits will be made to the Le Roi, Le Roi 2, Centre Star and War Eagle mines.

**Wednesday, Sept. 16th.**—A special train will leave Trail for Greenwood, arriving at 1 p.m., where arrangements will be made for visiting the very complete copper smelting works of the British Columbia Copper Company, the Mother Lode mine and the smelter at Boundary Falls, owned by the Dominion Copper Company.

**Thursday, Sept. 17th.**—Special train will leave Greenwood early in the morning for Phoenix, where several hours will be spent in visiting the important mines, including those of the Granby Company, the Brooklyn mine, owned by the Dominion Copper Company, and the Snow Shoe, operated under lease by the Consolidated Mining & Smelting Company of Canada, Limited. In the afternoon the important smelting works of the



Granby Company at Grand Forks will be visited. At midnight a special train will leave for Nelson.

**Friday, Sept. 18th.**—The day will be spent at Nelson, and arrangements will probably be made for a visit to the Bonnington Falls power plant at Bonnington Falls. At midnight the train will leave to connect with the steamer, which will take the party across the Arrow Lakes to Arrowhead. Arrive at Revelstoke in the evening.

**Sunday, Sept. 20th.**—Arrive at Victoria in the evening. Three days will be spent in Victoria and excursion will be arranged and a reception given by the Local Committee.

**Thursday, Sept. 24th.**—Arrive at Vancouver in the morning and visit Stanley Park, leaving by the east-bound train for Banff in the afternoon.

**Friday, Sept. 25th.**—Arrive at Banff at night.

**Saturday, Sept. 26th.**—Visit Bankhead Collieries near Banff. Entertainment at luncheon or dinner by the Government of Alberta.

**Thursday, Oct. 1st.**—Arrive Montreal.

#### Railway Rates, Etc.

The railway companies having generously agreed to accord a special rate of half single fare each way via the route travelled, the transportation charges will be approximately as follows:

Nova Scotia—Quebec Excursion (Quebec to Sydney, \$9.25; Sydney to Sherbrooke, \$7.35; Sherbrooke to Thetford, \$1.15; Thetford to Montreal via Sherbrooke, \$2.75). Total, \$20.50.

Ontario Excursion (Montreal to Toronto, \$5; Toronto to Niagara and return, going steamer, returning rail, \$2.85; Toronto to Cobalt, \$4.95; Cobalt to Sudbury, \$2.75; Sudbury to Toronto, \$3.80; Sudbury to Montreal, \$6.30). Total, Montreal to Sudbury and return, \$21.85.

Alberta—British Columbia Excursion (Montreal or Toronto or North Bay to Rossland via the Crow's Nest

Pass, Rossland to Greenwood, Greenwood to Nelson, Nelson to Victoria, Victoria to Montreal) \$76.85.

(N.B. The approximate rate specified for Stage III. includes the specified rates for Stage II, except the Niagara and Cobalt parts of that Stage.

Sleeping cars will be engaged for the entire trip, and those taking part in the excursion will be required to deposit with the Treasurer an amount covering the charges for the accommodation they desire reserved for each stage. The charge for berths will be as follows:

Nova Scotia-Quebec Excursion, \$18.

Ontario Excursion, \$15.

Alberta-British Columbia Excursion, (from North Bay), \$70.

The Institute will have its own dining car service, and members of the party will be charged at the rate of \$3 per day for meals, payable in advance for each stage of the excursion.

In order to secure train accommodation, applications must be received by the Secretary not later than July 15th. After that date the list will be closed and accommodation will not be guaranteed. Applications will be accompanied by deposits subject to forfeiture) as follows:

For the Nova Scotia-Quebec trip a deposit of \$25 will be required.

For the Ontario trip a deposit of \$25.

For the Alberta-British Columbia trip, \$75.

Or for the whole excursion, a deposit of \$125.

Berths will be allotted as applications are received.

Railway tickets will be issued by the Secretary before the departure upon each stage of the excursion.

Persons joining the train locally are reminded that they cannot be insured sleeping car accommodation unless they have previously arranged therefor with the Secretary.

H. MORTIMER-LAMB,

Secretary.

## PROGRESS WITH THE GRONDAL PROCESS OF CONCENTRATING AND BRIQUETTING IRON ORES.

By P. McN. Bennie, Fitzgerald & Bennie Laboratories, Niagara Falls.

Ottawa Meeting Canadian Mining Institute, March, 1908.

The growth of an art is reflected in the broadening meaning of its definitions. Mining and metallurgy are twin arts so closely related that it is hardly conceivable how they could have had other than simultaneous birth. Mining might be more broadly defined as the art of getting minerals and ores out of the earth, while metallurgy is the art of getting metals out of ores. They make mutual demands upon each other, as, for example, when mining discloses the nickel-cobalt arsenides of the Cobalt district, the ores are laid at the door of metallurgy, with the announcement "There's something new for you, get those things out for us.

Metallurgy makes similar requests of mining, and it is within the province of this paper to recount briefly to what progress the mining of certain kinds of iron ore has been stimulated by the demands of metallurgy.

Last year our laboratories prepared a paper dealing with the magnetic concentration of iron ores by the Grondal process, with some remarks upon the briquetting of such concentrates. This year we are happy to report considerable progress along both lines, as having great interest for Canada, and as indicating that the elements of a very important industry, as yet undeveloped, exist within her borders.

The conditions of supply in the iron ore markets of the old world are in a measure comparable to those which exist on this side, and particularly in the States. Recent years have witnessed the gradual depletion of ores best suited for the Bessemer process, until now there is a universal appeal from the metallurgical world to the mining world for relief from burdens which are becoming heavier year by year upon the



shoulders of pig iron and steel makers. The only visible means of relief seems to be (aside, of course, from the discovery of new ore bodies) some method of improving the quality of iron ore supply, such as an increased iron content, a lowering of slag-forming impurities, with reduction of sulphur and phosphorus to the lowest limits. Magnetic iron ores lend themselves readily to such treatment.

There exist in Sweden and Norway large quantities of magnetic ores ranging from 30 to 60 per cent. iron content, with varying amounts of sulphur and phosphorus. In order to recover a sufficient percentage of iron to make operations profitable, fine grinding is necessary. With fine grinding the iron can be brought up by concentration to between 63 and 68 per cent. Under these conditions the Grondal process of wet concentration gives very satisfactory results. Last year the Engineering and Mining Journal published a list of 19 magnetic concentration plants actively in operation in Sweden, 12 of which now use Grondal apparatus entirely. At the present time there are a number of additional plants under construction, destined to use Grondal apparatus for concentration and briquetting. To show the substantial manner in which treated ores are coming to the relief of the iron ore situation abroad the following is a list of works which are using the Grondal processes for concentrating and briquetting:—

Works.	Tons ore Treated.	Concentrates.	Briquettes.
1. Strassa . . . . .	150,000	75,000	60,000
2. Bredsjo . . . . .	40,000	.....	20,000
3. Herrang . . . . .	60,000	.....	30,000
4. Guldsmeshyttan . . . . .	90,000	45,000	30,000
5. Uttersbergs . . . . .	24,000	.....	12,000
6. Flogberget . . . . .	50,000	.....	24,000
7. Lulea . . . . .	60,000	.....	50,000
8. Sandvikens . . . . .	.....	.....	12,000
9. Horndal . . . . .	.....	.....	12,000
10. Helsingborg . . . . .	.....	.....	50,000
11. Cwmavon (Wales) . . . . .	.....	.....	36,000
12. Alquilfe (Spain) . . . . .	.....	.....	40,000
13. Penn. Steel Co. . . . .	200,000	100,000	.....

Where tons of concentrates are not given, the whole output is briquetted. Where only briquettes are given, concentrates or fine or purple ores are used.

There are also under construction the following plants:

Works.	Tons ore Treated.	Concentrates.	Briquettes.
1. Hellefors . . . . .	20,000	.....	10,000
2. Vigelsbo . . . . .	20,000	.....	10,000
3. Salangen . . . . .	300,000	.....	100,000
4. Sydvaranger . . . . .	1,200,000	.....	600,000
5. Traversella . . . . .	50,000	.....	25,000
6. Riddarhyttan . . . . .	20,000	.....	10,000

775,000

**Sydvaranger Development.**

The plant under construction at Sydvaranger is an interesting example of the extent to which the exigencies of metallurgy will drive mining into the remote corners of the globe. If anyone should propose to this Institute, as a feasible and profitable plan, the mining of iron ore containing only 38 per cent. metallic iron, in a latitude corresponding to that of our scarcely

known Baffin Land, or as far north as the mouth of the Mackenzie River, he would probably be advised to take a complete rest for his health's sake.

Yet such a project is actually under way. A company has been fully financed by powerful German interests, all arrangements made with the Norwegian Government, and comprehensive plans perfected whereby a minimum production of 600,000 tons of concentrates annually will be producer, shipments to begin in 1910. The plant will consist of 40 units each, containing ball mill, crusher, tube mill and separators. At least 100 separators will be required. It has been found that standard Grondal ball mills will handle, on the average, 135 tons of hard magnetite ore per 24 hours.

The company at Salangen, Norway, is composed of certain German iron masters who will themselves absorb the entire annual production of 100,000 tons.

The foregoing has had to do with the commercial development of the Grondal processes. There have been some technical advances, however, of considerable interest, as follows:

(1) The introduction of heavy rock crushers, of the Gates or Blake type, for preliminary crushing, thus throwing less work upon the ball mills.

(2) Where the ore is of suitable character the use of magnetic cobbing machines to get rid of such rock pieces as contain little or no iron. This reduces the amount of ore to be handled in all subsequent operations, per ton of product.

(3) Somewhat finer grinding in the Grondal ball mills. It is generally found that the magnetite particles reduce more quickly than the gangue particles, so that the finer grinding does not necessarily involve reducing all the particles to pulpy condition. The practical effect of such finer grinding is a higher percentage of recovery and a higher iron content in the concentrates. As most of the concentrated material is destined to be briquetted, the fact that the grains are smaller is of no moment.

With regard to briquetting, the following may be noted as improvements:

(1) Better design of briquetting presses, reducing the wear. The life of the die plates has been quadrupled. At Cwmavon, working on pyrites residues, a single set is good for about 500 tons of briquettes.

(2) The original briquetting furnaces and cars were one metre wide. It has been found that this may be increased to 1.5 metres without materially increasing the investment. The result of the change is a 50 per cent. increase in the daily production of the furnace. The furnaces therefore will give a tonnage approaching the nodulizing kiln, with the advantage that the briquettes are more desirable from the metallurgical point of view.

(3) The fuel consumption, which in the one-metre furnaces had reached the low figure of 7 per cent. of the weight of briquettes produced, should be still further reduced in the wider furnaces.

(4) Bilbao spathic ore has been treated very successfully. The ore was first ground in a tube mill to 0.75 mm. mesh. The mill will grind about six tons per hour, using 75 horse-power to drive it. The ground ore was mixed with a little water, pressed and burnt in the usual manner. The original ore ran 47 per cent. iron, which, with the loss of carbon dioxide in the briquetting furnace, brought the iron content of the finished briquette up to 58 per cent.



RESULTS OF GRONDAL METHODS OF CONCENTRATING AND BRIQUETTING

ORES.	Crude Ore.			Concentrates			Tail- ing		Briquettes	
	Fe. p.c.	S p.c.	P p.c.	Fe. p.c.	S p.c.	P p.c.	Fe. p.c.	Fe. p.c.	S p.c.	P p.c.
Bredjso . . .	35.0	0.15	0.010	67.2	0.050	0.004	6.9	65.1	0.020	0.004
Flogberget .	27.3	0.31	0.003	67.4	0.040	0.003	7.1	65.3	0.007	0.003
Guldsmed- shyttan . . .	50.7	3.0	0.003	70.1	0.5	0.002	10.2	68.2	0.010	0.002
Helsingborg (purple ore)	60.6	0.17	.....	.....	.....	.....	.....	60.6	0.023	.....
Herrang . . .	40.2	1.21	0.003	67.3	0.170	0.002	6.4	65.5	0.003	0.002
Hjulsjo . . .	39.7	0.12	0.008	67.1	0.035	0.004	10.1	65.2	0.015	0.004
Lulea . . .	58.2	0.110	1.230	71.1	0.015	0.005	12.0	69.3	0.005	0.005
*Riddarhyt- tan . . .	52.8	0.025	0.006	64.2	0.017	0.003	7.4	.....	.....	.....
Salangen . . .	35.7	0.039	0.23	69.3	0.019	0.009	4.9	.....	.....	.....
Strassa . . .	46.8	0.030	0.015	69.2	0.015	0.003	6.1	67.1	0.005	0.003
Stripa . . .	40.3	0.030	0.010	67.1	0.020	0.002	12.2	65.2	0.005	0.002
*Sydvaran- ger . . .	38.0	0.066	0.030	68.3	0.026	0.014	5.5	68.0	0.006	0.014
Uttersberg .	34.5	0.020	0.024	62.6	0.020	0.016	9.3	.....	.....	.....
*Gelsbo . . .	35.2	0.45	0.026	64.6	0.089	0.002	6.7	.....	.....	.....
Cwmavon . .	61.43	1.65	0.019	.....	.....	.....	.....	61.5	0.044	.....

\*Under construction.

Fuel Economy.

Last year's paper referred to the fuel economy introduced by the use of Grondal briquettes as due to several reasons.

(1) High iron content and consequent small amount of material to be slagged off.

(2) Porosity of briquettes, permitting an enormous surface of contact between reducing gases and iron oxide (this porosity averages over 20 per cent. of the volume of briquettes).

We do not feel that our tests are sufficiently complete to warrant positive figures as to fuel economy, as several factors influence the results. We may refer, however, to one test of 1,000 tons of Strassa briquettes, containing 65 per cent. Fe., put through a blast furnace at Cockerills' well-known works, Seraing, Belgium, where a fuel economy of 15 per cent. was claimed. If such results turn out to be actually realisable in practice they would have great significance for Canadian furnace men.

Market Prices.

During the past year the following prices have been paid: For concentrates, containing 68 per cent. Fe., for home consumption in Sweden, about \$3.65 per ton, on cars at concentrators. For export, containing 65 per cent. iron and about 10 per cent. water, \$4.25 at port of export.

For briquettes, f.o.b. port of export, for briquettes containing 65 per cent. Fe., sales have been made at \$5.45 per ton.

Ten thousand tons have been engaged for Germany for this year at about \$5.25 at same port. Purple ore briquettes from Helsingborg bring about \$6 per ton c.i.f. Stockton. Pyrites residues briquettes from the South Wales works command from \$5.50 to \$6.35 delivered, according to cost of transport. These briquettes contain about 62 per cent. Fe. with sulphur down to 0.044 per cent.

Importance to Canada.

It seems to us that these results contain a lesson to us on this side of the Atlantic well worth a moment's consideration. In the first place, there are in Canada, and particularly in Ontario Province, numerous bodies of magnetite of some extent, which to-day are prac-

tically dormant. There is a rapidly growing production of pig iron and steel, with a correspondingly increased demand for ore. Some makers have even had to resort to the use of imported ores. Yet right in Canada there are all the elements of a vast and profitable industry—an industry of basic importance to a country's prosperity—requiring only the awakening touch of intelligent capital to spring into active being.

Without making a plea for any particular apparatus, but assuming that the Grondal methods are employed, two locations present themselves as promising. These are shown as follows:

Central Ontario Valley.

In Fig. 1 is shown an outline of the C. O. Railway, upon which we have marked some of the deposits of magnetitic ores. At some of these deposits there could

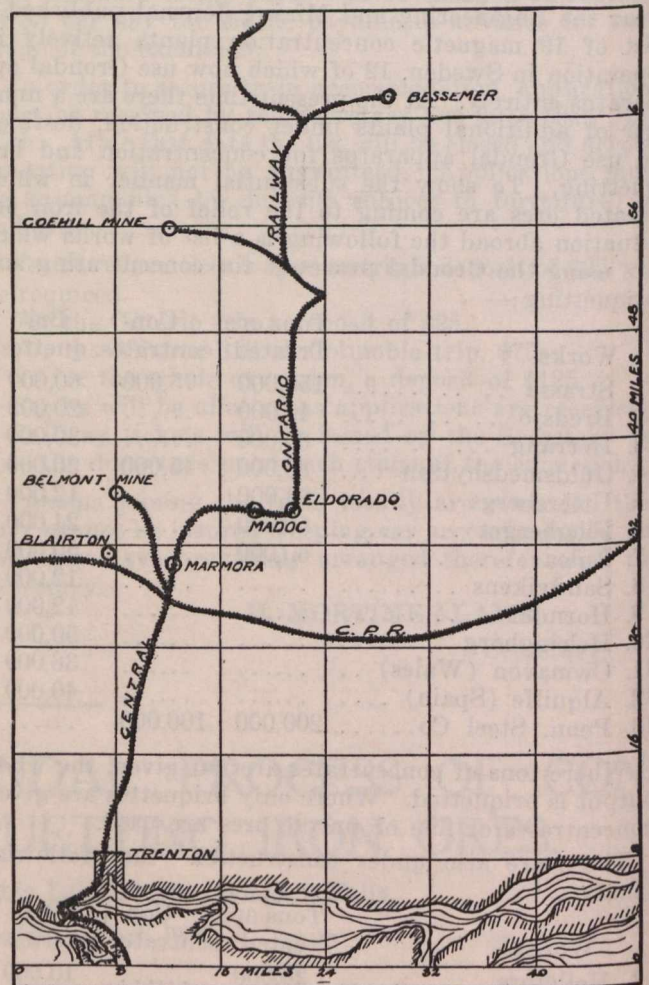


FIG. 1.

doubtless be mined a certain amount of shipping ore, but all of them contain large quantities of ore from 45 per cent. down in iron, which could profitably be treated. The distances from Trenton are approximately as follows:

- To Marmora . . . . . 30 miles.
- To Blairton . . . . . 35 miles.
- To Madoc . . . . . 40 miles.
- To Eldorado . . . . . 40 miles.
- To Belmont . . . . . 35 miles.
- To Coe Hill Mines . . . . . 75 miles.
- To Bessemer Mines . . . . . 85 miles.

Now if a central briquetting plant were to be located at Trenton, to which all materials could be sent, we



would have a plant producing marketable products within an average distance of 50 miles from the mines, which is less than the distance from many Lake Superior mines to nearest lake ports.

**Kingston & Pembroke Railway.**

Fig. 2 shows a similar scheme, with Kingston as terminus, with the following approximate distances:

To Godfrey . . . . .	29 miles.
To Verona . . . . .	25 miles.
To Glendower . . . . .	35 miles.
To Clarendon . . . . .	55 miles.
To Robertsville . . . . .	59 miles.
To Wilbur . . . . .	67 miles.
To Calabogie . . . . .	89 miles.

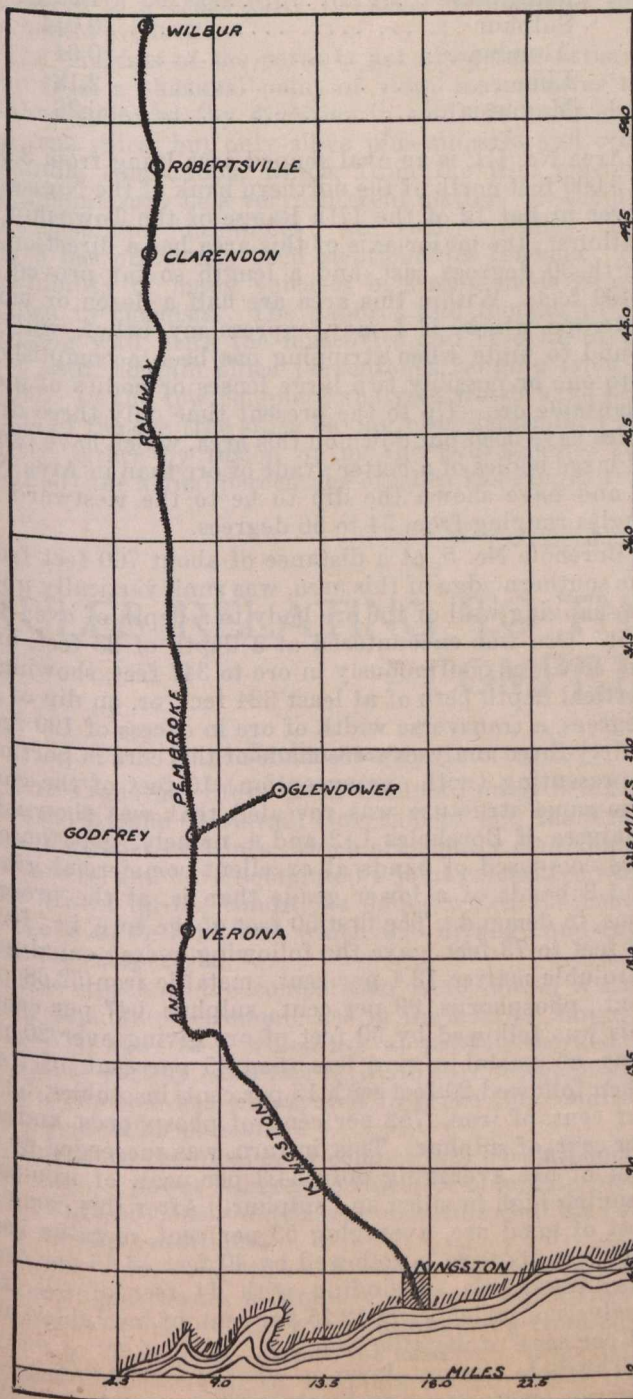


FIG. 2.

From these points an average freight rate of 65 cents a ton could probably be obtained. A central plant at

Kingston would be under practically similar conditions with respect to its sources of supply as the Trenton location. It might be found upon close study that it would pay to ship all ores to a central point where both concentrating and briquetting could be done in a single plant under one management.

**Cost of Products.**

Based upon 40 per cent. ore, as a maximum figure of 80 cents per ton loaded at mines, 2 tons would be needed per ton of concentrates . . .	\$1.60
Average cost of concentration on a production of 200 tons daily . . . . .	.40
Cost of concentrates . . . . .	2.00
Average cost of briquetting on 200 ton basis . . .	.45
	<hr/>
	2.45
Freight on 2 tons ore at 65c . . . . .	1.30
	<hr/>
Cost of briquettes . . . . .	\$3.75

**Market Values.**

Under the above conditions we would have for sale a briquette containing from 63 to 65 per cent. metallic iron, low in sulphur and phosphorus, easily reducible in the blast furnace with economy of fuel; such briquettes would be superior to the average run of old range Bessemer ore, on which the guarantee is now 55 per cent. iron. The present price for such ore is \$5 per ton, according to The Iron Trade Review of February 13, 1908. In European and United States markets Grondal briquettes would readily command a minimum price of 10 cents a unit, or \$6.30 delivered. This leaves a margin of \$2.65 per ton to cover freights and profits. There is no reason to believe that equal selling prices could not be realized in Canada. The Swedish companies using the process have formed the Iron Expert Association, whose products find a plentiful and profitable market in Europe. It is interesting to note that every operating company has been a financial success from the start.

With rich ores commanding a premium and the iron and steel world eager for them, there is no good economic reason why many idle spots in Canada should not teem with this modern industry; why mining should not once more respond to the call of metallurgy.

**PERMITTED BRITISH EXPLOSIVES.**

The following is a complete list of the names of permitted explosives defined in the schedules to the Explosives in Coal Mines Orders of December 17, 1906, of April 8, 1907, and of May 26, 1908:

Explosives in first schedule:—Abbeite, albionite, ammonal, ammonal B., ammonite, amvis, aphosite, arkite, bellite No. 1, bellite No. 3, bobbinitite, britonite, cambrite, carbonite, celtite, cliffite, clydite, colliery steelite, Cornish powder, curtisite, dahmenite A, dragonite, electronite, excellite, extra carbonite, Faversham powder, fracturite, geloxite, good luck, haylite No. 1, kolax, kynite, kynite condensed, minite, monobel powder, negro powder, Nobel carbonite, normanite, oaklite No. 1, oaklite No. 2, odite, permitite, permonite, permonite II, phoenix powder, pit-ite, rexite, ripping ammonal, rippite, roburite No. 3, russelite, saxonite, stow-ite, thunderite, titanite, tutol, victorite, virite, westfalite No. 1, Westfalite No. 2, withnell powder.

Explosives in second schedule.—Bickford's igniter fuse.



## A NEW IRON ORE FIELD IN THE PROVINCE OF NEW BRUNSWICK.\*

BY JOHN E. HARDMAN, S.B., M.A.E., MONTREAL, QUE.

(Continued from last issue.)

The following record of the seven holes drilled is necessarily abbreviated, but for the purposes of this paper will be sufficiently comprehensive.

Borehole No. 1 was located some 200 feet south of the northern end of the deposit found Area No. 1. At the northern end of this area there is a small hill, rising on the southern bank of Austin Brook precipitously to a height of 78 feet, from which height there is a gradual descent to the south of nearly 40 feet, and at the base of this slope and on the hanging, or western, wall of the deposit No. 1 Borehole was put down to a depth of 162 feet. It was in ore continuously from 35 feet to the bottom, giving 127 feet of core which was analyzed for insoluble matter, iron, phosphorus and sulphur, the average length of core represented by each analysis being 10 feet. In this core there was found to be great variation; insoluble matter ranged from 8.04 per cent. to 27.74 per cent.; metallic iron had a minimum of 39.6 per cent. and a maximum of 57.2 per cent. phosphorus varied from .486 to 1.007, and sulphur showed variations from .047 per cent. to .699 per cent. Close inspection of the results when tabulated showed that the ore occurred in bands or strata, ribbon-like, and that these strata were easily separated the one from the other, so that it would be quite possible to hand sort the ore into two piles, one of which would easily exceed 52 per cent. of metallic iron with a minimum of silica, and the other would contain approximately 45 per cent. of metallic iron with the maximum amount of silica. These bands or strata of good ore range from 10 to 25 feet in thickness. Subsequent stripping of the surface clearly showed a banded structure.

No. 2 Borehole was put down approximately in the middle of Area No. I, about 800 feet south of the first borehole. Its depth is 161 feet. It began in iron ore and showed 140 feet of merchantable ore. Like No. 1 hole it shows a banded structure and out of the 140 feet there are 60 feet which average:

Metallic iron 54.11 per cent., insoluble matter 16.7 per cent., phosphorus 0.73 per cent., sulphur 0.098 per cent.

On the bank of the Nipisquit River, and at the extreme southern end of Area No. I, Borehole No. 3 was located but, unfortunately, upon the foot wall instead of on the hanging wall of the deposit; it therefore proved barren, but a sample taken from the surface at this point gave: Metallic iron 51.6 per cent., silica 15.28 per cent., phosphorus .82 per cent., sulphur .05 per cent.

No. 4 Borehole was put down about 450 feet to the westward of the outcrop and about its centre; this made it on the hanging wall of the ore body. The total depth attained by this hole was 527 feet, the first ore was encountered at a depth of 434 feet and for 70 feet, or to a vertical depth of 504 feet, the ore was found continuous and of the same quality as has been shown in the previous analyses.

These four holes proved the existence of an ore body of at least 2,140 feet in length to a depth of 500 feet below the surface, which, in itself, is a very considerable deposit. Of this large amount of ore fully one-half will give 53 per cent. metallic iron and not over 15 per cent. of silica.

Area No. II, so-called, lies about 1,000 feet to the eastward of Area No. I. It presents at least five distinct

outcroppings in the shape of knobs or small lenticular masses, the axis of which has a more easterly direction, being north 30 degrees east, as against north 15 degrees east for Area No. I. No boreholes were put down upon this area, which previously had had some stripping done by a representative of the Dominion Iron & Steel Company. From the lines of the magnetometric survey made by Mr. Lindemann it will be fair to assume a length of 1,500 feet for the axis of the ore body in Area II. Surface samples from this Area gave the following analysis:

Iron . . . . .	50.23
Silica . . . . .	15.32
Phosphorus . . . . .	0.623
Manganese . . . . .	1.29
Sulphur . . . . .	0.044
Alumina . . . . .	0.94
Lime . . . . .	2.18
Magnesia . . . . .	0.26

Area No. III. is an oval shaped area lying from 3,000 to 5,000 feet north of the northern bank of the Nipisquit River in Lot 12 of the 17th Range of the Township of Bathurst; the major axis of this area has a direction of north 30 degrees east, and a length so far proved of 2,400 feet. Within this area are half a dozen or more outcrops which, if I may express my belief, will be found to unite when stripping has been accomplished, into one or possibly two large lenses or bodies of merchantable ore. Up to the present time only three drill holes have been put down on this area, which have proved large bodies of a better grade of ore than in Area No. I, and have shown the dip to be to the westward at angles ranging from 54 to 56 degrees.

Borehole No. 5, at a distance of about 700 feet from the southern edge of this area, was sunk vertically upon the hanging wall of the ore body to a depth of over 350 feet. Ore was encountered at a depth of 23 feet, and the core was continuously in ore to 347 feet, showing a vertical depth here of at least 324 feet, or, on dip of 55 degrees, a transverse width of ore in excess of 190 feet. Thirty-three analyses were made of this core in portions representing (with one exception) 10 feet of the core. The same structure was revealed that was shown by analyses of Boreholes 1, 2 and 4, namely, that the ore was composed of bands of excellent commercial grade and 3 bands of a lower grade than is, at the present time, in demand. The first 50 feet of the core, i.e., from 23 feet to 73 feet, gave the following average analysis: Insoluble matter 13.4 per cent., metallic iron 52.68 per cent., phosphorus .99 per cent., sulphur .047 per cent.; this was followed by 50 feet of ore giving over 20 per cent. of insolubles and less than 45 per cent. of iron. Then followed 20 feet with 15 per cent. insolubles, 52.58 per cent. of iron, .752 per cent. of phosphorus, and .05 per cent. of sulphur. This, in turn, was succeeded by 70 feet of ore averaging only 44.3 per cent. of iron and running high in silica and sulphur. After this came 50 feet of good ore, averaging 53 per cent. metallic iron, which in its turn is followed by 40 feet of 46 per cent. ore; the whole concluding with 44 feet of ore, the analysis of which gives 12.25 per cent. of insolubles, and 54 per cent. of metallic iron.

This hole was put down on what, upon further investigation, may prove to be the easternmost bed in this No. II area; at a transverse distance of 250 to 300 feet to the west another series of strongly magnetic lenses appear, but none of them have been drilled. The last

\* Incorrectly printed "British Columbia" in last issue.



hole, No. 7, is located about 750 feet north of No. 5; it encountered iron ore at a depth of 30 feet and passed out of the ore at about 107 feet; in this 77 feet there are nearly 60 feet of excellent ore. Beginning at 40 feet in depth up to 83 feet there is a length of core 42 feet 6 inches long, which averages 53.10 per cent. metallic iron, with 17.02 per cent. of insoluble matter. From 91 feet to 107 feet there are 16 feet of ore averaging 54.32 feet metallic iron, with 14.37 per cent. of insolubles.

Consideration of these figures will, I think, clearly indicate that iron ore in very large quantities exists in this hitherto unknown region. The depths to which the boreholes have proved the existence of the iron, coupled with the horizontal extent over which the ores are known to exist, and the widths (which have been measured to average fully 100 feet) demonstrate that the bodies are large.

The analyses of the cores is not altogether satisfactory from a chemical point of view, inasmuch as the method followed (by digestion in acid) does not show the true silica, but only silica plus silicates and other insoluble compounds, which, from the iron master's standpoint, may be a very different matter. In the present case the "insolubles" are really country rock, which has previously been mentioned as igneous. The insolubility of many silicates in strong acids is well known to chemists. The gabbros and diorites of the hanging wall, with the muscovite and chlorite of the foot wall, contain silica percentages ranging from 50 to 80. In the few complete analyses which have been made of the ore (the silica having been determined correctly, either by fusion or by the hydro-fluoric acid method) the actual percentage of silica has ranged from

7 to 12, and there have been found amounts of alumina ranging from .05 to 1.2, lime from 2 per cent. to 3 per cent., and magnesia from  $\frac{1}{2}$  to 1 per cent.

By hand picking or rough lump sorting fully one-half of these large ore bodies can be made to average from 57 to 58 per cent. metallic iron, with 10 per cent. of silica; the phosphorus in such ore will run about 0.88 per cent. and the sulphur 0.055 per cent. With ores of such a character no gentleman conversant with the iron ore markets of the European continent would be disposed to quarrel.

For such a basic ore the demand is now large and steady, and the location of this new field within 20 miles of a sheltered deep water harbor enhances its commercial importance, as ocean shipments from this harbor can be made during at least 9 months of the year.

The property, including some 30 square miles of territory, passed into the control of the Drummond Mines, Limited, in November, 1907, and by this corporation it will be actively exploited this summer; it will also be tested in the furnaces of the Londonderry Iron & Mining Company, although its composition is such as to occasion no uncertainty as to the quality of pig iron obtainable from it.

Although the ore is a non-bessemer, the significance of this new district to Eastern Canada is very great. Iron ores of good quality are scarce in our Dominion, and so far have been at considerable distances from the seaboard; it is, therefore, with the feeling that this new field is well worthy of a preliminary notice, and that it will probably add very largely to the Dominion's resources of furnace ore, that I have ventured to bring this account to your notice.

## RULES RELATING TO THE TRANSVAAL STOPE-DRILL COMPETITION, 1908.

### Preliminary.

The Transvaal Stope Drill Competition is being organized by the Transvaal Government and the Transvaal Chamber of Mines, which are jointly contributing the prizes, and have nominated a joint committee which has drawn up the conditions under which the competition is to be held, and which will arrange and carry out the competition.

The object of the competition is to obtain a small drill capable of economic use in the narrow stopes on the Witwatersrand, which are at present worked for the most part by hand labor. With this object in view, the committee has endeavored to make the conditions as practical as possible.

To reduce the number of competitors within manageable limits, power is taken to reject or eliminate entries which are obviously outclassed or unsuited to the existing mining conditions.

In the final competition, mining conditions must be taken to mean work in stopes varying in width from 20 inches to 48 inches, and with a dip varying from 20 degrees to 90 degrees. It may be assumed, further, that probably 90 per cent. of the holes drilled will be down holes.

The committee anticipate that all or most of the machines entered will be worked by means of compressed

air, the most usual method on the Witwatersrand; but, should any entries offer of machines worked by other kinds of power, the committee will consider such machines.

Competitors who desire to protect their patent rights must make their own arrangements for obtaining provisional protection.

### CONDITIONS OF THE TRANSVAAL STOPE DRILL COMPETITION.

#### A.—General.

1. In these conditions the following expressions are used, with the meanings set against them:

"The committee" means the Technical Committee appointed jointly by the Transvaal Government and the Transvaal Chamber of Mines to arrange and carry out the competition, or any duly appointed sub-committee or representatives of the committee.

"Competitor" means the person, firm or company entering a machine for the competition. A competitor will be treated as a separate competitor in respect of each type of machine entered by him, the committee deciding what constitutes a different type.



"Machine" means the whole drilling machine, without supports or dust-allayer, provided the supports and dust-allayer are not integral parts of the machine, and does not include the drill.

"Drill" means the jumper.

"Bit" means the cutting end of the drill.

"Elimination trials" means the preliminary trials on surface and underground.

"Competition" means the final trial underground.

2. The decision of the committee in all matters relating to the trials and the competition shall be final. Competitors shall be bound by these conditions. The committee reserves the right to relax, alter or add to the requirements of any of these conditions should it think it desirable in any particular case. The committee reserves the right to repeat the trials or competition or any part thereof in respect of any entry should it think fit.

3. The committee may disqualify any competitor in respect of any or all of his entries, if satisfied on enquiry that he has interfered in the conduct of any of the trials or competitions or has corrupted any miner, or has attempted to do so, or if he refuses to comply with any conditions laid down by the committee. No prize shall be awarded to any entry in respect of which any competitor is so disqualified.

#### B.—Entries.

4. Entries must be received on or before December 31st, 1908, by the

"Secretary of the Committee,  
Transvaal Chamber of Mines,  
Johannesburg,  
Transvaal."

Entries must be made on a form which may be obtained at the above address, or from the

"London Secretary,  
Transvaal Chamber of Mines,  
202 Salisbury House,  
Finsbury Circus,  
London, E.C."

5. All entries must be accompanied by:

- (a) Detailed specifications and drawings.
- (b) A list of prices of the machine and accessories, including drills, bars and arms (where such are required) and spare parts, and an illustrated and numbered list of spare parts in triplicate.
- (c) A guarantee to the satisfaction of the committee to supply machines and accessories in Johannesburg at the price quoted in the price list, subject to ordinary trade fluctuations in the price of materials.
- (d) With respect to the conditions contained in paragraphs (b) and (c) of this clause, if an intending competitor is unable to assign prices to the machine and its accessories, he shall at the time of his entry notify the committee in writing of this fact, and also of his acceptance of the following conditions:
  - (1) The machine and accessories shall, for the purpose of the competition, be valued by the committee.
  - (2) The competitor shall enter into an agreement to allow the Transvaal Chamber of

Mines or its nominees to manufacture and use the machine and accessories at a royalty of a percentage on actual cost, such percentage to be stated by the competitor at the time of entry.

6. Each competitor shall at the time of entry nominate a representative for all purposes of the trials and competition, who may be either himself or another person. Such representatives must be in Johannesburg throughout the trials and competition, and may be present with his machine at any time. The committee may allow the appointment of an alternate.

7. No entry will be accepted in respect of a machine weighing more than 100 pounds. It is desirable that the machine should be lighter than 100 pounds, as the need of the industry is for a one-man machine.

8. All machines, accessories and parts intended for use in the trials or competition (other than drills) shall be personally delivered free of cost in Johannesburg by the competitor's representative to the committee not later than January 31st, 1909, at such place as the committee shall appoint, and no machines, accessories or parts not so delivered shall be used in the trials or competition, except as desired by the committee.

9. All machines, accessories and parts so delivered shall remain in the possession of the committee, which shall not be responsible for loss or damage in the course of the trials or competition, and which reserve the right to retain any machines or spare parts for the purpose of testing materials.

10. Each machine shall be supplied in a strong box fitted with a padlock, and the accessories and spares shall be supplied in a separate box with padlock.

11. Competitors must supply with each machine a suitable dust-allayer, which may be either a part of the machine, or attached to it, or separate.

12. Each competitor must supply three machines to the committee, and may supply such other machines and spare parts as he may desire, which shall be kept in the custody of the committee and issued for use only with the committee's consent.

13. A competitor may supply his own drills, and may change the supply during the competition on complying with the conditions of Clause 5, but the committee reserves the right to decline to use any drills so supplied if it considers them unsatisfactory.

14. No entries will be accepted which do not fulfil the conditions of Clauses 4 to 13 inclusive.

15. The committee reserves the right to reject the entry of any machine which appears to it, from the drawings and specifications, to be unsuitable in material or design.

16. No entries may be withdrawn except by permission of the committee.

#### C.—Elimination Trials.

17. To reduce the entries for the first six months' underground competition to a number that can be conveniently handled, elimination trials will be held successively on the surface and underground.

18. The following conditions will apply to the elimination trials, both on surface and underground:

- (a) The competitor may, if he so desires, provide his own operator, but the committee reserves the right to put the machine to such tests under its own operators as it may think fit.



- (b) All holes drilled shall not be less than 42 nor more than 48 inches in depth (no credit being given for any depth beyond the maximum), and shall be drilled with not more than four steps of gauge. The size of the starting and following bits will be left to the choice of the competitor, but the last bit used shall gauge at least 15-16 inch at the conclusion of drilling.

19. The following conditions will apply to the surface elimination trial only:

- (a) Two machines of each entry, or more at the discretion of the committee, will be tested as to their efficiency in drilling down holes in granite blocks.
- (b) Competitors may decide the air pressure to be supplied, which shall not be less than 60 pounds nor more than 75 pounds per square inch. In the absence of any requisition from the competitor, the pressure will be 75 pounds per square inch.
- (c) Each machine will be tested for one hour actual drilling time, provided that a total of two hours for rigging up, changing drills, drilling, etc., is not exceeded.
- (d) The air consumption of each machine will be taken into account in deciding whether such machine has passed the elimination trial.
- (e) All entries will be eliminated which cannot drill a minimum of one inch per minute of actual drilling time.

20. The following conditions will apply to the underground elimination trial:

- (a) Only machines which have passed the surface elimination trial will be allowed to enter.
- (b) One machine of each entry will be subjected to this trial.
- (c) The trial will last three periods of eight hours each, such periods to include time spent in changing drills, rigging up, etc.
- (d) All trials will, if practicable, be conducted in the same stope at the air pressure prevailing, which shall not be less than 60 pounds nor more than 75 pounds per square inch.
- (e) A machine will only be allowed to drill three holes per rig-up, each rig-up to be at least 15 feet from the previous one.

#### D.—The Competition.

21. At the end of the underground elimination trial, the committee will arrange the entries taking part therein in order of merit with regard to footage drilled and air consumed, and will then decide which may enter for the competition.

22. All machines not eliminated in the previous trials will be entered for a competition under practical working conditions underground, which will begin about April 1st, 1909, and is expected to last six months.

23. Two machines of each entry will be run for 300 shifts each, by day and night, continuously, with the exception of Sundays and legal holidays. The length of shift will be of equal duration on each mine.

24. If any entry of which two machines, in spite of the provisions of Clauses 32 and 35, fail to complete 300 shifts each, the footage drilled shall be charged with the estimated cost of 300 shifts; but time lost

through no fault of the machine may be made up with the consent of the committee.

25. The mines and working places in which the competition will be carried out shall be selected by the committee. So far as practicable, each entry will be run for an equal period in each stope in each mine selected.

26. Each pair of machines will in each shift be in the charge of one white miner selected by the committee, with such native assistance as in the opinion of the committee is required.

27. During the competition the machines will do ordinary mining work, in according with instructions given to the miners from time to time by the committee. Not more than two holes on any one rig-up shall be counted, except with the express sanction of the committee. Any number of bars of any length may be used. As far as practicable the conditions under which the different machines work shall be kept uniform.

28. The competing machines will not be required to cut pillars, box holes, etc.; this will be done by the mines.

29. The miner will be forbidden to use any machine or spare parts except those issued to him by a representative of the committee.

30. A reasonable supply of spare parts will be issued to each miner from time to time by the committee as required for each machine operated by him. The miner will sign a receipt for all such issues, and will keep them under lock and key in a box provided by the committee.

31. All worn and replaced parts shall be returned by the miner to the committee not later than the end of the shift in which they were thrown out. A label, signed by the committee's representative, shall be attached to each such part, shewing the period for which it has been in use.

32. If either of the pair of machines at work is so disabled as in the committee's opinion to require to be sent to the surface for repair, a third machine, supplied by the competitor and stored in the working place, shall be issued by the committee to take its place, but such third machine shall be returned as soon as the repair is completed. Machines supplied by the competitor in addition to the three required by Clause 12 shall only be issued with the special sanction of the committee.

33. When any machine is to be moved from a mine or working place in which it has been tested to another, it shall be handed over, together with all spare parts in hand, by the miner to the committee, and checked by the latter. The removal will be entirely under the control of the committee.

34. No machine will be operated at a pressure exceeding 75 pounds or less than 60 pounds per square inch at the end of the pipe line, as shown by recording gauges.

35. The air consumption of each machine will be tested on the surface at least once a month during the competition, at intervals chosen by the committee to afford a good knowledge of the average consumption by the machine underground. While a machine is withdrawn from work for this purpose, its place will be taken by a third machine supplied by the competitor. Should this for any reason be impossible, the time lost may be made up.

#### E.—Basis of Award for Machines.

36. The first price of £4,000 will be awarded to that entry for which the total cost when divided by the total footage drilled by all machines of that entry during the



competition is least, the committee reserving the right, in case of two or more entries showing approximately equal results, to ignore small difference in points and award the prize to that entry which it considers best suited for the Rand, having regard to weight, general design, ability to drill deep holes, freedom from stoppages and breakdowns, facility of handling, and suitability to narrow stoping.

37. The second prize of £1,000 will be awarded to that entry which is considered by the committee, on the basis laid down in the preceding paragraph, to be second best.

38. The footage drilled shall be measured at the end of each shift. No hole of a depth of less than 42 inches shall be counted, except where authorized in special circumstances by the committee's representative, provided that any hole fitchered at a depth of not less than 30 inches shall be counted. The last bit used shall gauge at least 15-16 inch at the conclusion of drilling.

39. For the purposes of Clause 36 "Cost" shall mean the cost of:

- (a) First cost of machines and rig-up gear, less valuation at end of the competition.
- (b) Miner's wages.
- (c) Native labor.
- (d) Air.
- (e) Water.
- (f) Drill sharpening.
- (g) Maintenance.
- (h) Stores.

40. As regards the above items the following rules shall apply:

- (a) Machines and rig-up gear will be debited to cost at prices fixed as prescribed in paragraph 5, but will be valued by the committee at the end of the competition, and the value so assessed will be taken to credit of the competing machine.
- (b) A proportion of miner's wages will be charged, viz., 5s. per machine shift.
- (c) Native labor will be charged at a uniform cost per head per shift on each mine throughout the competition.
- (d) Air will be charged at a price per cubic foot according to pressure used, as fixed by the committee. These prices will be uniform on all mines.
- (e) All water used will be charged at cost.
- (f) Drill sharpening and making drills will be charged at cost, which, if competitors supply their own sharpening machines, will include maintenance and depreciation, but not first cost, of sharpening machines.
- (g) Maintenance—
  - (i.) Spares, including hose and coupling, will be debited as issued; any returned unused being taken to credit.
  - (ii) Repairs mean actual shop charges and fitter's time charged at a standard rate fixed by the Committee.
- (h) Stores, to include drills, lubricants and waste. Drills will be charged at ruling prices, except when supplied by the competitor, when they will be charged at prices fixed as prescribed in para. 5.

41. Competitors may supply their own drill sharpening machines, but the committee takes no responsibility

for their safe return or for any damage sustained. Competitors may, with the consent of the committee, instruct the drill sharpeners, except where otherwise arranged by the committee. All drill sharpening will be done under the control of the committee on the mine where the machine is competing, and by usual drill sharpeners on the mine.

42. Repairs must be done in the shops of the mine where each machine is competing, but competitors may provide their own fitter, who shall not be allowed underground.

#### F.—Choice of Miners.

43. Miners will be chosen in pairs, to work day and night shifts in partnerships. Mine managers will be asked to nominate pairs of men, who should be machine men chosen on grounds of general intelligence, whether employed on the nominator's mine or not, and to state their qualifications and experience. From the list obtained the number of partnerships required will be selected.

44. Miners will be paid 25s. per shift, with a bonus of one-eighth of any profit made by the committee through the work in the stope in which the miner is employed. Each miner will sign a contract with the committee to work the whole six months of the competition, and to permit the retention of 10 per cent. of his wages till the expiry of his contract. Should he leave before such expiry, except on account of illness or accident or other cause approved by the committee, the amount retained shall be forfeited, and may be paid at the end of the competition to the miner taking his place. A miner temporarily absent through illness, accident or other good cause may be temporarily replaced by a man employed by the committee on day pay.

45. Each partnership will as far as possible work in one stope throughout the trial, and will work in accordance with instructions given by the committee.

46. The committee may dismiss and [or] disqualify for a prize any miner whom it may consider to be incompetent or otherwise unfit for the position.

#### G.—Basis of Award for Miners.

47. The first prize will be awarded to that partnership whose cost per fathom broken is least, provided that a factor shall be used to equalize the conditions in different stopes, such factor to be arrived at by the committee after obtaining an estimate of the price per fathom in each stope from a sub-committee consisting of the managers and mine foremen of all the mines selected for the competition.

48. The remaining prizes shall be awarded on the same basis.

49. The prizes shall be:—

- 1st.—£300 to the winning partnership.
- 2nd.—£200 to the second partnership.
- 3rd.—£100 to the third partnership.

50. In the event of a prize going to a partnership which has been changed during the competition, the prize money will be divided between the two partners working at the end of the competition according to the time worked by each, but any partner who has left on account of sickness shall receive a share proportionate to the time he has worked.

51. The stopes will be specially surveyed at the beginning and end of the competition, and at such other times as the committee may think necessary, on the



lines laid down in the Interim Report of the Mining Regulations Commission.

52. The costs charged against the miners shall be the same as in the case of machines (see paragraph 39 above), with the addition of the cost of explosives used.

53. A deduction shall be made for fathomage estimated to have been broken by a miner with a machine, the entry of which is withdrawn or disqualified.

### BOOK REVIEW.

**General Index to Reports of the Geological Survey of Canada—1885-1906.** Compiled by F. J. Nicolas. Printed by the Government Printing Bureau, Ottawa, 1908.

The absence of a full and reliable index to the publications of the Geological Survey of Canada has long been a grievance. Searchers for information touching any given topic have had no alternative but to wade in and look through the whole uninventoried stock. Apart from the loss of time thus occasioned, unnecessary strain was put upon the readers' temper. Thus, publications of great intrinsic value have lost much of their interest.

The new index remedies this state of affairs. For the period that it covers it is complete, accurate, and most accessible. Typographically everything is so arranged as to make reference easy and rapid. Cross-references are not multiplied needlessly. Nevertheless wherever necessary ample subject cross-references are given.

The precise accuracy with which all references have been checked is evident on every page. One or two instances will serve to illustrate. On pages 101-102, there are no less than twenty-seven "Black Rivers" classified and differentiated. Under each of the twenty-seven, sub-references are given.

On page 316, under the black-letter title "Fish," there are fifty-six light-type sub-references grouped. These sub-references are again grouped under the sub-titles of provinces. Thus the reader can see at a glance exactly what he wishes to look up and exactly where to find every mention of it.

The reports of field geologists sometimes contain errors in the nomenclature of places, or topographical features. The compiler has avoided copying these blindly. In all cases of uncertainty or error, the names of localities have been verified and in several instances the authors of reports have been set right.

All of this, of course, was not possible without generous help from Survey officials and others. Mr. Nicolas, indeed, tenders warm thanks to all the officers of the department. Of the assistance of Mr. D. B. Dowling, Mr. Hugh Fletcher, Dr. R. W. Ells, and Mr. W. McInnes he makes grateful mention. He also mentions his indebtedness to Mr. James White, Dominion Geographer, who gave most important assistance in checking over the spelling of the names of Canadian localities. Mr. Nicolas also indicates his gratitude to Dr. A. P. Low for constant encouragement and kindly criticism.

The index is a radical departure both in the science of index making (of which it is a brilliant example), and in the publications of the Survey.

The Geological Survey and the compiler are deserving of large credit.

### EXCHANGES.

**The Iron and Coal Trades Review, June 19th, 1908.**—Under title "A Dormant Factor in the Iron Industry" the Review draws attention to the position of France as a future producer of iron ore. Both Germany and Belgium are increasing their demands upon French sources. Sooner or later Great Britain will be forced to purchase ore from France. Meanwhile the Republic conscious of her latent strength, is developing her iron industry rapidly. The present cordial relations existing between Great Britain and France are thus given a commercial significance.

**The Colliery Guardian, June 19th, 1908.**—Mr. James Ashworth, in a communication to the Guardian, takes up mine watering. The "percentage" of saturation effected by means of any method of watering, varies in different parts of any mine. The deep mine is hotter and drier than the shallow mine. A man working in an atmosphere of 82 to 85 degrees F. can exist only for a limited period. In a warm saturated atmosphere of, say, over 82 degrees F., the perspiration from a man's body cannot pass away and therefore no sense of coolness is possible. Hence watering is inapplicable to deep mines and some other means will have to be found.

**The South African Mining Journal, May 30th, 1908.**—The Journal alludes editorially to the slowness with which dust-allaying devices are being introduced on the Rand. A clause of the Mining Regulations says that no rock drill may be used without means being provided and employed to allay the dust generated in drilling. This instruction is not sufficiently explicit to be effective. Experience has taught that a simple jet of water playing just above the collar of the hole is the method that is most useful and that proves most acceptable to the miners. Although this plan has been adopted in one or two mines with excellent results, it is not yet in general use. It should be made compulsory, at least in drifts and raises. The "extraordinary apathy and even active opposition" of the miners towards steps such as this for ameliorating their hardships, is remarked upon.

### PERSONAL AND GENERAL.

Mr. Floyd Harman has assumed the management of the Cochrane mine, Cobalt, Ont. The buildings on this property were destroyed by the recent fire. Rebuilding will be commenced at once.

Mr. J. L. Retallack, who with Mr. Louis Pratt, have spent many months in Ottawa, in the interests of Kootenay lead producers, passed through Toronto on the 26th of June on his way to the west.

Mr. T. R. Drummond, formerly manager of the Dominion Copper Company and, until recently, manager of the Nipissing mine, Cobalt, Ont., has assumed the managership of the Cactus mine at Newhouse, Utah.

Representatives of the Western Branch of the Canadian Mining Institute are to meet the special train at Fernie, B. C. At Victoria a special committee, of which Premier MacBride is chairman, will have charge of the reception.



To entertain the Canadian Mining Institute delegates and their guests the following committee of Rossland, B. C., citizens has been appointed: Mayor McDonald, Messrs. R. H. Stewart, P. S. Couldrey and A. G. Larsen. The committee will act in conjunction with the Mayor and city council and the Board of Trade.

Mr. W. H. Boyd has been appointed topographer in charge of the topographical work of the Geological Survey. The excellent topographical work he has done

in the west as shown in the Boundary and Rossland special maps, is a guarantee that the general standard of accuracy of the Survey maps will be increased under his supervision. Nothing is of greater utility to the public as a whole than good topographic maps and this recognition of topography by the Survey may be read to mean that topographical work will receive a similar place in the Canadian Survey as has been given it in the United States Geological Survey.

## INDUSTRIAL SECTION.

**Amatite Roofing.**—The objection urged against the use of ordinary prepared roofing is that it requires coating periodically with heavy paint. Amatite roofing is free from this criticism. A top surface of crushed mineral makes painting unnecessary. It is weather proof and so substantial that repairs are not necessary until years of service have been got out of it. A sample will be sent on request by the Paterson Manufacturing Company, Limited, Toronto.

**The Jenckes Machine Company, Sherbrooke, Que., Catalogue No. 112, Second Edition, 1908.**—In addition to their Sherbrooke works this company has recently erected large branch works at St. Catharines, Ont. The catalogue before us gives descriptions of the Jenckes horizontal tubular boilers, standard smoke stacks, grate bars, rocking grates, high pressure tubular boilers, vertical tubular boilers, steel penstocks, eac. All boilers are tested to hydrostatic pressure of at least one and one half times their specified working pressure before leaving the works. A boiler inspector's certificate of inspection is furnished at actual cost.

**Catalogue 26, June, 1908.—The Jeffrey Manufacturing Company.**—The Jeffrey centrifugal fan for mine is the subject of this pamphlet. After a year of systematic testing the Jeffrey Company has brought out a fan especially designed to meet the demand for large volumetric capacity at low speeds and against high water gauges.

The positions and curvatures of the vanes, which discharge the air in a true radial direction, with no dragging effect, are special features of this fan. The bracing is especially strong and does not obstruct the air inlet. Steel is the only material of construction and each fan is assembled and erected, perfectly balanced and marked in every part before being shipped.

**Reactions.**—A quarterly bulletin distributed by the Goldschmidt Thermit Company, is filled with interesting reading. The Thermit Process is applicable especially to rail welding. The operation of welding can be performed without interruption to traffic. A gang of four men can make 20 or more joints per day. The Thermit weld has been used for a wide range of work, from steel ladles in copper smelters to the rudder frames of large steamships.

The process is based upon the reduction of metallic compounds by aluminium. The reaction is accompa-

nied by a considerable evolution of heat and propagates itself from one point until the entire mixture is affected. As a means of starting the reaction barium peroxide is found most satisfactory.

The Goldschmidt Thermit Company has opened a branch at 103 Richmond street West, in this city. Contracts for welding heavy sections, such as crank shafts, locomotive frames, etc., will be undertaken. At the shops, repairs on small castings, not exceeding 1,000 pounds, will be performed.

**The Behrend Dry Concentrator For All Ores.**—The ore must be fairly dry, crushed, pulverized and screened to certain sizes, which are determined by the physical conditions. Thus it will be understood that successful concentration depends upon economic capacity, and perfection of the preliminary work to insure high grade effect in the operation of concentrating machines.

The new concentrating machines operate on the principle of air exhaust. The current enters into the lower end between the table and top dressing plate, a point where the concentrates are discharged, the air force, which can be perfectly regulated, carrying with it the lighter gangue matter down into the base of the machine onto baffle boards, and when sufficient weight has accumulated upon a flexible outlet valve, said valve opens and discharges the tailings. The table being rapidly vibrated, the heavier concentrates travel in the opposite direction and are discharged at its lowest end where the air current enters, as above specified. The finer material, dust from the raw ores undergoing dressing, is carried on through with the exhaust air into and through a duct to dust chamber if desired, or into the open air outside of the building.

The machine works entirely on the principle of specific gravity of materials under treatment. By simply lowering the dressing plate, which contracts the space through which the air is drawn, the force is so concentrated that only mineral of the heaviest specific gravity contained in the material can be discharged. The lighter minerals will be carried over as tailings, and these can be run to a second machine for the separation of the next heaviest specific gravity. In this manner the several minerals in concentrates can be readily separated.

By referring to the outline drawing, Fig. 3, it will be seen the air enters at A, and is carried over the entire surface of the table S, the arrows indicating direction. The tailings discharge at B. The table is under rapid vibration by the eccentric C. The ore is fed into the table through the false bottom and pocket D. The

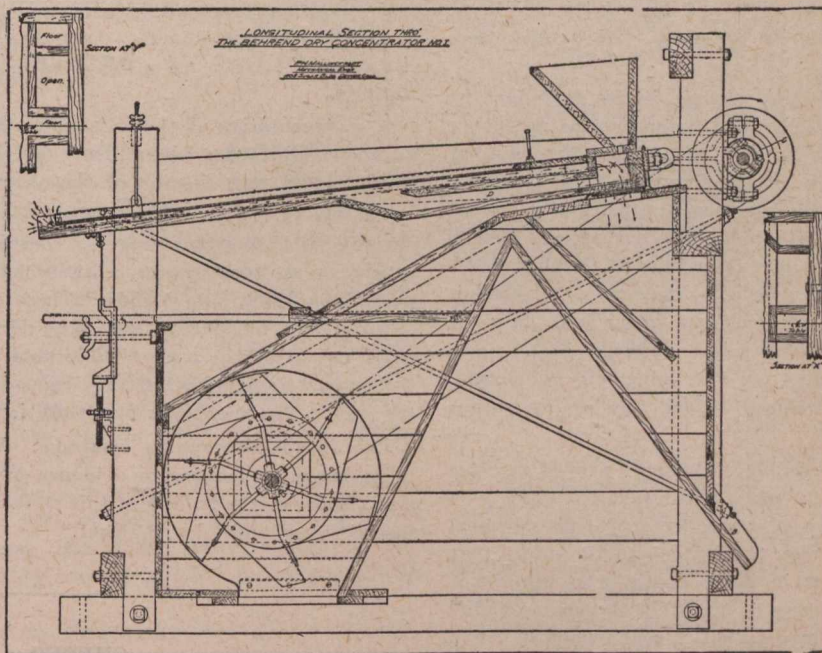


dressing plate entirely covers the table and, combined, constitutes the air flue. Said plate is moveable in a perpendicular line, which can be raised or lowered, creating a variable air current, according to the gravities of material under treatment, to insure discharge of any degree of concentration desired. The volume of air and ore feed is also under complete control.

The operation of the machine, as before outlined, is very positive and simple. When adjusted to discharge the concentrates, it requires absolutely no attention beyond occasional inspection, to insure continuous and highly efficient work; consequently, it requires no expert ability, merely eyesight. A person of ordinary intelligence could operate 50 machines as efficiently as a man of skill at high wages.

A very important consideration in connection with employment of the Behrend system of concentration is, that a mill of this description can be installed contiguous to the mine, instead of hauling the ore to a mill at some remote place where water is available,

2. Silver-lead ore, baryta gangue from West Cliffe, Col., recovery 90 per cent. lead.
3. Silver-lead ore from Cashier Mining & Milling Company, Boulder County, Co., recovery 90.2 per cent.
4. Bismuth ore from New Mexico, 95 per cent. extraction.
5. Tungsten ore, Boulder County, recovery, 90 per cent.
6. Tellurium ore, Cripple Creek, Col., value \$5.25 per ton, recovery 75 per cent.; value of concentrates, \$65 to \$172.
7. Canadian corundum; extraction 75 per cent.
8. Ore, silver sulphides, gangue of quartz and baryta, which had never been concentrated to any commercial degree by any system; recovery 75 per cent. From various sizes operated upon the following products and values were obtained from "mill dirt" having an average value of 24 ounces silver per ton: 201.68 ounces per ton, 242.60 ounces per ton, and 440.56 ounces per ton.



frequently imperative in any country, at a cost which would make the difference between profit and loss. The capacity of the concentrating machines is eight to fifteen tons, according to sizes operated upon, in 24 hours, the average being twelve tons. The weight of a machine is 500 pounds, and it can be transported to almost inaccessible places in mining districts. The floor space required is 3½ by 6 feet. Power required is ½-horse power.

The advantage to be derived by employment of the Behrend concentrators in only one phase of the system, is excess extraction, or higher degree of concentration over the wet system. Comparative tests showed gains of 10 to 30 pr cent. at less cost.

The following record of work done by the Behrend concentrators represents only a few of the incidental tests made:

1. Ore containing lead, 9 per cent.; zinc, 12 per cent., the other constituents being iron and silica. Results: 70 per cent. lead concentrates, the iron carrying less than 1 per cent. lead, about 3 per cent. zinc, and the zinc product was brought up to 40 per cent.

The above tests were made on "mill dirt" from tunnels, drifts, stopes and dumps of the Blue Bird mine, Grand Island district, Boulder County, Co.

A testing plant under the Behrend system is maintained at 48½ Inspector street, Montreal, Que., where the machine can be operated on all ores.

**STIBNITE IN FRANCE.**

The auriferous stibnite of Martigne-Ferchand, France, occurs in a greenstone dyke which courses through black and yellowish-brown, fine grained, porous quartzites. The dyke is 33 feet wide. It can be traced for nearly a mile. The stibnite contains 0.0009 per cent. gold, and the ore also includes arsenical pyrites carrying 0.0008 per cent. gold, iron pyrites, limonite, and occasionally a little native gold. The gangue consists chiefly of quartz and calcite, with some brown spar associated. Vugs and druses, occur frequently. \*The lodes are probably the infilling of contraction-fissures in the greenstone. The industrial importance of the Martigne stibnites is much lessened by the arsenic present.



## SPECIAL CORRESPONDENCE

### NOVA SCOTIA.

#### Glance Bay.

The referendum vote of the members of the P. W. A. has come and gone, and the result was a small majority in favor of the American organization. The total eligible membership was 10,000, so it is said, but of this only about half cared sufficiently about the matter to go to the poll. The character of the vote is interesting, varying according to the locality. Pictou county, as one would expect of the descendants of so distinguished an ancestry, went solid for the native organization. Cumberland county, who are without doubt the Athenians of Nova Scotia, desired a change. In the Glance Bay district it was noticeable that at those collieries that have traditions and are come of age the vote was for the Canadian body. At the more youthful collieries it was the reverse. It can hardly be said that a majority of 500 out of a vote of 10,000 is at all conclusive, especially when one considers the energy that was displayed by the U. M. W. A. advocates and the apathetic indifference manifested by the rank and file of the P. W. A. So for the nonce, like the man in the song, "we dunno where we are."

One well known text book on mining, in its introduction, lays down the axiom that a colliery "the conditions are never ideal," which same is most true. During the first half of June it looked as if the mines of the Dominion Coal Company were going to beat all records, and reach a mark that would stand for a long time, but they didn't. The output was 343,000 tons, which is about 4,00 tons less than that of October, 1907. The reason that the output was not larger was an accident to the haulage engine of Reserve colliery, which laid the mine idle for several days. The Hub mine produced 13,700 tons, and from now on the outputs from this mine will be normal. The Emery mine, No. 10, produced 15,500, the largest output from that mine as yet.

It is surprising what remarkable statements are offered for public consumption, and are meekly swallowed by those who don't know better. A Montreal paper recently quoted some Halifax shareholder of Dominion Steel stock to the effect that "there was not a coal owner in Nova Scotia who would not sell slack at \$1.24, if he were sure of a market the year round." We venture to assert that there is not a coal owner in Nova Scotia who could sell slack at \$1.24 per ton all the year around and keep clear of the Bankruptcy Court. Such statements are the most arrant nonsense, indeed they are a little worse than nonsense. There was a time in the coal trade when slack was a drug on the market, but it is not so to-day. Modern methods of firing boilers, the use of bye-product ovens, and other contributory causes have put slack on about the same footing as runmine, indeed there are many firms who buy runmine, and afterwards crush it to slack, as they prefer it that way. Improved methods of mining make less slack, and it is a far cry to the old days when thousands of tons of valuable coal were left in the mines in the form of riddled slack at the time when miners were paid for round coal only. But even if slack were a difficult thing to sell it could not be sold at \$1.24. If anyone doubts this, let him try to buy it in Nova Scotia at that price, and his doubts would quickly vanish.

No. 12 Colliery is emerging out of chaos. The bankhead foundations have been excavated, concrete culverts laid down, and the concreting of the air shaft is about completed. Several of the permanent colliery buildings are already erected, and altogether a good deal of construction work has been done during the recent fine weather, considering the difficulty of transporting material before the completion of the railway branch.

Mr. Dennis, of the Geological Survey at Ottawa, has recently visited the mines of this neighborhood, and taken samples of the coal coming over the screens of different collieries. This has been done for the purposes of the admirable work now being carried on by the staff of the McGill University, under the direction of Dr. Bonsall Porter, namely the determination of the commercial worth of all Canadian coals, and a classification of their analyses, washing tests, boiler tests, etc., similar in character to the monumental work of the Coal Testing Bureau at the St. Louis Exposition some time ago. The various and numerous samples of Canadian coals that are awaiting treatment in the buildings of McGill is an eloquent commentary on the wealth of the Dominion in commercial coals. When the work the McGill people are now engaged on is completed it will afford a very valuable mass of data of a kind that has never previously been collected in Canada, and its publication will be awaited with considerable interest.

### ONTARIO.

#### Toronto.

A representative of the "Canadian Mining Journal" inspected the exhibit of gold ore from the Harris-Maxwell property, Larder Lake, now on view at the office of the Toronto Star.

The ore is the typical silicified dolomite, rusty in spots and seamed with quartz stringers. Disseminated throughout the specimens are iron pyrites, a little chalcopyrite and galena and possibly a little zinc blende. These sulphides occur in small spicules and amount to not more than one per cent. of the total weight of the ore. Visible gold is sprinkled freely along the quartz stringers when they come in contact with the country rock. The specimens on exhibition are rich.

This is an encouraging symptom. While it is by no means to be taken as conclusive evidence of Larder Lake's value as a mining field, the finding of this striking specimen ore certainly justifies continued development.

### QUEBEC.

#### Montreal.

A promising discovery of asbestos has recently been made on lot 16, range 4, township of Thetford, at a distance of about four and a half miles from Thetford Station. Asbestos was known to occur on this lot for several years, but little attention was paid to this until about one week ago when a rich shoot in the southwestern corner of the property was located. The quality appears to be the same as found in the Thetford and Black Lake mines. Veins measuring one inch and over, yielding an excellent crude No. 1 were found, while veins of smaller width in immediate vicinity cover an area of about 125 feet long and 50 feet wide.

On lot 17, the adjoining lot, veins of half-inch have been found in the southeasterly part over an area of about 50 by 40 feet.

It is likely that the Robertson serpentine range, which seems to have a large extent is a continuation of the famous Thetford serpentine, which has contributed so largely to the world's output of asbestos for the last ten years. No work to speak of has yet been done on these new discoveries, but judging from the remarks of an asbestos expert who has made lately a thorough examination of these deposits, the districts will in all probability become a producer of fibre of some importance.



Mr. F. M. Whitney, head of the American Asbestos Company at Black Lake, has sold out his interests to the British-Canadian Asbestos Company for a large cash consideration, retaining, however, \$400,000 of shares in a new company to be formed with a capital of \$2,000,000. The American Asbestos Company in 1900 took over the property known the Murphy lot, close to the railway works of the Quebec Central, at Black Lake. A mill of a capacity of 500 tons of rock per day was built, which since 1904 has produced as an average continuously about one car load of asbestos fibre and clay. Last year the company bought the old asbestos properties of the Glasgow and the Manhattan, adjoining, and since that time in addition to the mill fibre has produced from 40 to 50 tons of crude per month. The new company will continue operations for the present as heretofore, but innovations and improvements of a large extent are contemplated for 1909.

### BRITISH COLUMBIA.

#### Victoria.

The threatened abandoning of the Kaslo & Sandon Railroad by the Great Northern has aroused strong protests from these places. The Government of British Columbia has acted promptly in support of this protest by sending an official telegram to the Great Northern.

The Kaslo & Slocan Railroad was built under a provincial franchise. A bonus of 400,000 acres of land was given along with other valuable concessions. The land is now worth a great deal. The line runs from Kaslo on Kootenay Lake to Sandon, a distance of about 20 miles. A short branch connects Sandon with Cody, further up the valley.

Recently the train service has been cut to three trains per week. The Great Northern now intimates its intention of cutting off Sandon and Cody altogether by building a Y at McGuigan Siding and running the trains from Kaslo to McGuigan and back. They contend that as two costly bridges have been destroyed by landslides, the Sandon traffic does not justify their replacement.

Should this plan be carried out Sandon would be cut off from communication with the rest of South Kootenay. Slocan is only 21 miles from Nelson. But if the change is made it will be necessary to go round by way of Nakusp, a distance of 125 miles.

In the memorial sent to the Premier by the residents of Kaslo it is pointed out that, while the new arrangement would afford accommodation to the Rambler-Cariboo mine, which ships from McGuigan, and to the Lucky Jim at Bear Lake and to the Whitewater mines, it would cut off direct communication between Kaslo and Sandon for freight, passengers and mails and would deprive all the mines at Sandon of an alternative and competing outlet for ores. Moreover, the Last Chance, American Boy, Sunset, Reco, Goodenough, and other mines tributary to the Cody branch would be forced to haul their ores to Sandon by team, a distance of one to three miles.

Whilst the petitioners admit that the road has not been a paying one since its acquisition by the Great Northern, they draw attention to the large concessions obtained by that railway. In accepting these concessions and in exercising its right of appropriating private lands the Great Northern has incurred corresponding obligations to the Government and to the public. The railway owns a large system of lines in British Columbia and is constantly adding to these. It is not fair that the corporation should be allowed to abandon portions of its undertaking that prove temporarily unprofitable, while retaining the profitable propositions.

The Sandon camp is but now recovering from a period of extreme depression. It is believed that the depression was brought about by accidental causes, such as litigation and man-

agement, and not through any exhaustion of ore bodies. The camp, encouraged by the renewed bounty upon lead and by the prospects of a market for zinc ores, is entering upon a new and promising phase. The Great Northern should not be allowed to discourage a renewal of active mining operations.

It is also pointed out that by the proposed change a gap of ten miles will separate Kaslo and Sandon and the industrial, commercial, and domestic relations of eleven years' growth will be ruptured.

It is practically certain that the Government will intervene.

### YUKON.

#### Dawson.

All the Yukon is watching keenly the new method of mining auriferous gravels of the northern creek bottoms, which is being undertaken on the famous Bonanza Creek, a few miles from Dawson. The new method is to hydraulic the bottoms, and carry away the gravel with aid of an electrically driven lift or conveyor, resembling in principle the operation of a chain of buckets on a dredge. It is the first practical test ever made in the north with a conveyor or lift driven with electricity. Similar conveyors on a rougher scale have been driven in this country with steam, but the expense of generating the steam made them impracticable for operating anything but very rich gravels. The Yukon Gold Company, better known as the Guggenheims, are the originators of the electrical process here.

The low cost of power is the mainstay in this undertaking. The power will be used to lift water from a sump hole at the bottom of the conveyor, about fifty feet, to the tailing race, as well as to drive the buckets. The power is generated on Twelve Mile River, 35 miles distant, and brought over the hills by direct trunk wire. Pelton wheels driven by the river water generate the power.

The Guggenheims are planning to have three of the elevators erected this season. The process seems so certain to be a success that the company has not hesitated to make this heavy initial expense, which not only includes the purchase and installation of 100 tons of material to each conveyor, but also the carrying of the water many miles from the head of Bonanza, piping along the creek bottoms, digging of long open cuts, and other expensive incidental work.

Should this creek bottom process prove successful, and to most it seems there is no doubt of it doing so, the venture will be the cause of revolutionizing the methods of working creek bottoms. The conveyors are expected to be superior to dredges from the fact that the conveyors will clean out all overburden and gravel and leave the bottom, so that as much of the bed-rock as desirable can be taken up, and the remaining surface cleaned with water, brooms or otherwise, insuring the recovery of all gold in the creek bottom. The dredges, on the other hand, have to work under water, and the working of the bed-rock cannot be done nearly so satisfactorily.

One of the new conveyors has all the capacity of a dredge. In general appearance it looks like a huge steel skeleton tower, thirty feet square at the bottom and 12 feet square at the top, with long steel rods running up from each corner, forming the legs or general supports. It is to be mounted on rollers, and can be moved along the creek with aid of winches. As the gravel is washed into the sump by the hydraulic heads, it is caught in a string of buckets, which rotate over a ladder reaching from the bottom of the main frame work to the top, and standing at an angle of 75 degrees most of the way up, and graduating near the top to 45 degrees, before turning the tumbler at the top. Seventy-six buckets each with a capacity of three cubic feet comprise the bucket line. From the base to the top of the elevator is 59 feet. The buckets turn just below the



uppermost part of the frame, and, as they do so, throw the gravel into elevated sluices, of about the same height as the top of the bucket line.

One man standing on a platform at the top of the conveyor has before him several winches, with which he controls every motion of the big machine. Switches at one side will control the electrical motors driving the conveyor, and the pumps, so that the one man literally will be able to start and stop the whole works at will.

The procession of gravel, silt and other material which will be lifted by the buckets will require water equalling a small creek in volume to wash it through the sluices, and properly wash it, dissolve the plastic matter and relieve the gold. The sluices are three feet wide, and three feet deep, have a grade of six inches to 12 feet, and run back 40 to 60 feet from the conveyor, branching so as to distribute the tailings. These sluices, compared with the narrow primitive sluice boxes of the sourdough miner, or even the Klondike kings of old make the old specimens appear like pigmies beside a Hercules. The sluices of the conveyor are more like a large flume, and that they virtually are, with the riffles set in the bottom to catch the gold. Through these giant sluices will be poured 14 sluiceheads of water of 50 inches each, a total of 700 inches. This water will be lifted from the sump, and in lifting it a double service will be rendered, namely, clearing the sump of the flow from the hydraulic heads with which the gravels of the creek are being torn down; and in properly washing the gravels.

Two twelve inch pumps, especially designed for this work, will lift the water. Each pump will be driven with a seventy-five horse-power electrical motor, set on a platform in the middle of the conveyor frame. Beside these motors is one of the 50 horse-power motors which will drive the bucket line.

Two giants, with a total capacity of 500 inches, will tear down the gravel, and shoot it along the bedrock into the sump. In addition, there will be some water let in from the Bonanza Creek to ground sluice the muck and otherwise assist the giants. The extra water from other sources than the nozzles is found very essential in hydraulic work. It is needed to give greater volume to the stream in washing down the silt and gravel, as well as in groundsluicing. The total water pouring into the sump from water and nozzles and creek will have to be controlled so as not to exceed 700 inches, the capacity of the two pumps which keep clear the sump. Most of the time water going into the sump will run perhaps somewhat under the capacity of the pumps, thus not overworking the pumps. While it is planned to use but two giants at a time, there will be others supplied, into which the water may be diverted at any time. Each giant will require five sluiceheads of water. The head will be furnished by a drop of 350 from a penstock on the right limit, fed by the water conveyed from above the upper Bonanza dam by the Norwood ditch.

Before starting to work the ground, the claim will be cut in the middle with a bedrock opening, running lengthwise of the creek, and leading into the sump. In this opening will be set a string of steel sluices. Into these central sluices will be washed all the gravel and other moveable material above bedrock, and most of the gold will be caught in these sluices. What is not caught there will go through with the gravel, and be washed in the big sluices after leaving the conveyor buckets. Thus the gravel by the new method virtually is worked over twice in quick succession.

It is expected that it will be possible to work 400 feet up stream from the conveyor with the giants before it will be necessary to move up the conveyor. The gravel at No. 3 above is about 15 feet from surface to bedrock, and has very little overburden. With the width of creek existing there, which is 400 to 500 feet, it probably will be all one conveyor will be able to do to work out one claim of 500 feet in length in a season.

This much done, and the bedrock thoroughly cleaned will be quite an accomplishment. As soon as the creek claims are worked, and the bedrock cleaned, the creek tailing then can be dumped promiscuously into the valley, and the tailings will rise mountains high.

Twenty-five to thirty men will be required to attend to the ground and all the works about each conveyor night and day. All being satisfactory, as many conveyors can be supplied along the creek as is consistent with the water supply and the life of the conveyors in proportion to what will be a reasonable number of machines to do the work profitably.

The first of the conveyors has been completed, and the work undertaken this month, but it is not yet to be said to have turned over enough to have been given a thorough test. The plant will run day and night when well started. O. B. Perry, manager of the company, is the originator, it is understood, of the new conveyor. Should it prove a success, many of these conveyors no doubt will be installed in the Yukon country by other companies.

Bob Henderson, discoverer of the first gold in the Klondike valley, and his partner, Bill Forbes, left on the steamer Victorian, the first boat of the year up the Yukon from Dawson, for the Pelly River, where they will prospect this season. They will pole up the Pelly 300 miles, to a locality where they spent much of last summer.

They found gold on many river bars and on a number of creeks on the Pelly last year, and return there confident that a good camp will be opened in that country in time. Bob has many samples of gold from the district, and always has been enthusiastic over that field.

McLeod and others have been prospecting up the Pelly this winter, and it may be that they will have good news. No direct news of the results of the prospecting in the Pelly has been received this spring. Van Vibber and Van Gorder, who live in the last cabin on the last creek, 500 miles up the Pelly, have been expecting to find gold in time. They are so far up the Pelly as to be but a short distance from Findlay River.

Canada may look forward to the Yukon as a future field for the sale of large quantities of first-class mining equipment. The country has evolved rapidly from the days when wood fires, and then boilers and hoists were the only apparatus needed in working the ground for the placer deposits. Quartz mining is beginning, but placer is yet the chief industry. Scores of extensive large method mining plants have been installed in the Klondike since the region began to evolve from the old conditions of individual operation. The investment in dredges and hydraulic equipment have reached many millions, and this line of enterprise seems scarcely more than begun.

In connection with the dredges extensive outlay has been necessary for steam and water power plants, for generating of electricity, with which the dredges are driven. For each hydraulic plant long ditch lines often are necessary, necessitating in many instances extensive outlay for pipe material for siphons, to say nothing of the need of hydraulic giants and the other parts aside from lumber for flumes, penstocks and such.

The new style of electrically driven elevators or lifts for handling tailings from ground being worked by hydraulic on the creek bottoms also calls for extensive mechanical equipment. The frame work of the lifts are entirely of steel, and carry a steel bucket line, similar to a dredge, and are equipped with two large centrifugal pumps to each lift, for handling of water from the sump to the tailing boxes. The hydraulic giants used for washing the gravel down to the lifts are akin to the hydraulic plants used in the operations on hills.



The electrical equipment for conveying power is one of the biggest items of expense. Lines from a quarter of a mile to sixty miles long are installed already conveying power, and heavy wire, and transforming stations add to the quantity of equipment materially. In connection with each such line also is the generating equipment in form of dynamos driven by turbines or steam plants.

Some of the dredges are supplied with power from steam boilers aboard the craft, but the larger concerns have their steam or water power plants ashore, and electrical lines with which to convey the electricity to the dredges. The several big companies branching out are planning the installation of extensive power plants of most modern character. The power will be generated largely from the vast natural water courses, and conducted over hills and valleys with copper wires. In some instances there are plans to generate power at the coal mines, so as to avoid hauling the coal, and to transmit the power by wire direct from the mines to the place of consumption.

The many new hill groups organized for working on hydraulic plans will be demanding much more new equipment before long. Flumes, ditch line and pipe line material and giants and such will come largely into demand as a consequence.

The prospecting of the dredge ground also makes a demand for more modern equipment, in the way of large drilling machines. The keystone drill is the favorite for this purpose in the Yukon, and no less than ten are in use within ten miles of Dakson. These drills cost laid down at Dawson \$3,000 and \$4,000 each.

The dredges in use in the Klondike camp cost on the average \$140,000 to \$150,000 each, completed on the spot ready for starting. Of this cost approximately one-third is represented in the purchase price of the machinery at the factories. The remainder is for lumber, transportation and labor.

The fleet of dredges now in operation within 75 miles of Dawson including the following:

- Dredge No. 1 at mouth of Bonanza, working on claim 104 below discovery, owned by Guggenheims.
  - Dredge No. 2, on 104 below on Bonanza, owned by Guggenheims.
  - Dredge on 90 below discovery, Bonanza, owned by Guggenheims.
  - Dredge No. 91, Bonanza, owned by Guggenheims.
  - Dredge at mouth of Hunker, owned by Guggenheims.
  - Dredge on Anderson Concession, Hunker, owned by Guggenheims.
  - Dredge on 37, Hunker, owned by Guggenheims.
  - Dredge at mouth of Bear Creek, owned by Canadian Klondike Mining Company.
  - Dredge at mouth of the Klondike River, owned by the Bonanza Basin Gold Dredging & Mining Company.
  - Dredge on Bonanza, owned by the Lewis River Dredging & Mining Company.
  - Dredge on Indian River, owned by Indian River Gold Mining Company.
  - Dredge on lower Forty Mile River, owned by the Consolidated Gold Mining Company of Alaska.
  - Dredge at Boundary on Forty Mile River, owned by Consolidated Gold Mining Company of Alaska.
  - Dredge on South Fork of Forty Mile, owned by Mosier & Company.
  - Dredge on lower Walker's Fork of the Forty Mile River, owned by the Gold Scoopers' Company.
  - Dredge on upper Walker's Fork of the Forty Mile River, owned by Russell King and associates.
- In addition to this is a dredge being assembled at this writing at Whitehorse for operation this season on the Stewart River by the Yukon Basin Gold Mining Company. The same

company is planning the installation of several more dredges in subsequent seasons.

Several other large dredges also are being planned by other companies.

The hydraulic plants being operated near Dawson this season include:

Two giants on Acklen Group, right limit of the Klondike, opposite the mouth of Bonanza, 700 inches, owned by Guggenheims.

Two giants on Paradise Hill, left limit of Hunker, using 300 inches, owned by Guggenheims.

Two giants on Solomon Hill, left limit of Bonanza, using 400 inches, owned by Guggenheims.

Two giants on American Gulch, left limit of Bonanza, using 500 inches, owned by Guggenheims.

Two giants on Bunker Hill, right limit of Bonanza, using 500 inches, owned by Guggenheims.

Two giants on No. 3, above Bonanza, hydraulicking creek bottom into electrical lift No. 1, owned by Guggenheims.

Four giants on Adams Hill, owned by Bonanza Creek Hydraulic Company.

Seven giants on French Hill, left limit of Bonanza, owned by Detroit-Yukon Mining Company.

Plant on Whiskey Hill, right limit of Hunker, operated by Blanchfield & McCrimmon.

Plant on Whiskey Hill, operated by Joe Burke.

Giant on Paradise Hill, owned by Bert R. Elliott.

Giant on Delhi Hill, operated by Delhi, Rice & Peterson.

Plant on Temperance Hill, Hunker, operated by French Syndicate.

Giant on Temperance Hill, Hunker, operated by August Larson.

Plant on Temperance Hill, Hunker, operated by August Larson.

Plant on hill opposite Bee Gulch, operated by Detroit-Yukon Company.

Plant on Nugget Hill, opposite 55 below, operated by Gould & Murphy.

Four monitors, with 800 inches, working on Treasure Hill, Hunker, owned by Dolan & Tackstrom.

Two giants on left limit of 3 and 4 Last Chance, owned by Collins & Eilbeck.

Two giants, opposite 2 and 3 below on Hunker, operated by Jim Younkens.

Two giants opposite 9 below, Last Chance, operated by Jack Day.

Two giants opposite 6 above the mouth, left limit of Last Chance, owned by Jim Wilson.

Plant on Last Chance, operated by Rogers & Holland.

Plant on Goring Creek, opposite upper Hunker, owned by Miles, Grey and Cunningham.

In addition to the foregoing are several plants operating on Lovett Gulch and other points along Bonanza and Hunker by individuals whose names are not known.

In the Forty Mile country hydraulic work also is being undertaken by quite a number.

On Ballarat Creek, above Dawson, the Consolidated Company of Alaska has several giants.

Thistle Creek also has some hydraulic plants in course of installation.

On Barker Creek, a tributary of the Stewart, Graham and partner are installing a plant. The ditch is completed.

Hydraulic work also has been carried on quite extensively on the French Syndicate's ground on the Sixty Mile.

The N. A. T. & T. has an extensive hydraulic plant, long ditch and hydraulic lift on Miller Creek. The company also is clearing the ground there for dredge purposes.

Many large hills in the Klondike camp are being prepared for operation by hydraulic methods.



In the Circle district, at Rampart, Hot Springs, which are on the lower Yukon, hydraulic plants have been undertaken on extensive scale. These three districts are among the most important in the Yukon basin.

On the extreme upper Yukon waters are the tributaries of the Big Salmon, where plants are working on several creeks, including Livingstone, Cottoneva and other streams.

In the Atlin district, the waters of which are tributary to the Yukon, hydraulic work, with many large flumes and ditches, has been under way for years. Dredges and steam shovels also are used there.

The Klondike's new hydraulic plants will include the several to be fed by the mammoth ditch now being completed at a cost of five to ten thousand dollars, sixty miles over the hills from Twelve Mile River to the high levels of Bonanza and Hunker. Much of this water will be used to feed electrical conveyor plants.

The first of the electrical conveyors has been installed on Bonanza at a heavy cost, probably about \$50,000, and containing 100 tons of machinery and steel frame material. Two more of the plants are to be installed on Bonanza this season. Part of the machinery for the two plants is on the ground. The Guggenheims own the big ditch and the conveyors. The ditch will carry 5,000 inches of water.

The hydraulic and dredging mining has been under way in Klondike not more than three years, that is on anything more than a limited scale, and while millions have been expended in

ventures of this kind already, the working here by this method is barely begun.

The tailing heaps from the hydraulic plants are becoming decidedly noticeable on Klondike creeks. The immense quantity of gravel handled by the giants as in comparison with the old methods employed by the early miners affords a sharp contrast in size of tailing piles. Near discovery on Bonanza the tailings from off the left limit extend the full width of the creek, and are being banked high above the creek level with brush buttresses. The sheer rise on the outer edge makes a picturesque spectacle. The green brush lends a sharp contrast in color to the white mass of gravel showing on the surface. Over the whole spreads the stream of water from the sluices, carrying the gravel and sediment to all parts of the huge pile. There is no telling how high these brush walls will have to be built. Already they are 10 to 30 feet high, and the tailing pile, extending lengthwise of the creek feet, makes an imposing pile.

At the mouth of Eldorado is another huge tailing pile, extending the width of the creek, leaving a narrow place at one side for the water of the stream to pass.

As soon as the creek bed of Bonanza is worked out with dredges or electrical lifts, the building of bulwarks to retain tailings no longer will be required, and the tailings from the hills will be thrown over the brow of the hills into the creek bottoms with little trouble in keeping clear any space below unless it be merely sufficient opening for the water to pass down stream without backing up high enough to damage the road.

## GENERAL MINING NEWS.

### ONTARIO.

**Toronto.**—Government bounties during April were paid on 43,118 barrels of petroleum produced in Southwestern Ontario.

The Court of Appeal for Ontario has delivered judgment dismissing with costs all three appeals from the judgment of Chief Justice Meredith in the case of Crawford vs. the Lawson Mine, Limited, and McLeod vs. Crawford. These two actions were originally brought in connection with the long disputed title to the famous Lawson mine. Mr. Crawford demanded certain rights in connection with the Lawson mine, and Mr. Duncan McLeod and others interested in the property proceeded against Mr. Crawford and Samuel R. Clark, to enforce an agreement of settlement made April 6th, 1907.

The judgments of the Chief Justice were not satisfactory to the litigant, and three appeals were made to the Court of Appeal. One was by Thomas Crawford in connection with the dismissal of his action against the Lawson Mines, Limited, and John McMartin. Another was brought by Thomas Crawford and Samuel R. Clark, against the judgment in favor of the plaintiffs in the other action, and the third by the same defendants against the judgment in favor of Messrs. Millar & Bedells upon their counter-claim. All the appeals were heard together, the argument occupying more than three days. Their Lordships reserved judgment in order to afford an opportunity for perusal of the voluminous exhibits in connection with the case.

The judgment says: "It is needless to repeat the reasoning of the learned Chief Justice that the agreement was not capable of being enforced, because it purports to be made with a company not in existence. But it may be pointed out that the agreement of the 3rd of April did not alter the relation of Thos. Crawford as a trustee of the land for himself, Murdoch McLeod, Donald Crawford and John McLeod, or their representatives."

The judgment repeats several other findings, and concludes:

"For these, as well as for the reasons given by the learned Chief Justice, the appeals in the action of McLeod vs. Crawford fail and must be dismissed. And it follows that the appellant, Thomas Crawford, had no ground for the action instituted by him against John McMartin, and that it was rightly dismissed at the trial.

"All three appeals are dismissed with costs."

**Ottawa.**—Hon. Mr. Fielding has given notice of the following resolution in the Commons: "That it is expedient to provide that the bounty of one-half cent per imperial gallon on crude petroleum from Canadian wells, authorized by the act of 1904, shall apply to crude petroleum produced from shales, or other substances mined in Canada."

**Cobalt, July 8.**—The "blind pig" will soon be a thing of the past. The authorities have awakened. For two days the local police court has been kept busy. Fines ranging from \$50 to \$150 and a total of \$1,750 have been imposed. Forty "blind pigs" have been struck and seventeen convictions resulted.

**Cobalt Lake.**—Bulletin of progress, Cobalt Lake Mining Company:

**Mining.**—The drift in the north shaft is out underneath the lake a distance of 45 feet. This machine during the month drilled 33 feet and cut out the level station, and in addition the lower portion of the shaft has been timbered and planked and a substantial head frame erected over its mouth.

**No. 4, 1st Level.**—The north crosscut is now in 377 feet from No. 3 or 480 feet from the drift on No. 4, making the driving for this machine during the month 59 feet and in addition this machine sunk a winze on the No. 3 vein to a depth of 10 feet and is also responsible for a proportion of the ore broken down during the month. The ore broken during the month amounted after cobbing to 46 tons, most of which was broken by the



"baby" machine. A crosscut to the south is now in a distance of 522 feet, making the driving for this machine for the month 62 feet.

Second Level.—The west drift is now out underneath the lake a distance of 259 feet, and in addition this machine drove 12 feet to the east from the north crosscut and upraised 4 feet, making 36 feet of footage for this machine for the month.

No. 6.—The north drift is now out 87 feet and the east drift 34 feet, making 76 feet of driving for this machine for the month.

Our total footage during the month was 306 feet.

(Signed) E. L. Fraleck.

P.S.—The ore bagged this month consists of 1½ tons of first grade silver ore, 30½ tons of cobalt ore and 6 tons of cobalt ore, a total of 46 tons. We have on hand at the present time 27½ tons of silver ore, 12 tons of second grade silver ore, 85 tons of cobalt ore and 32 tons of niccolite, making in all 156½ tons.

We purpose shipping out a car of first grade silver ore on Monday, and also expect to ship one car load of cobalt ore on Tuesday, to the same parties as we shipped the last one and on the same conditions

(Signed) D. B. Rochester.

#### NOVA SCOTIA.

Halifax.—June 24 was the day appointed for the 10,000 voters of the P. W. A. to decide whether that organization would remain an independent entity or be merged in the U. M. W. A. A large vote was expected; but only slightly more than one-half of the possible votes were polled. Incomplete returns gave the U. M. W. A. a majority of 400.

Sydney.—Rumors are current that the Harmsworths are negotiating for the purchase of the Buchell coal areas at New Campbellton. The areas comprise five or six square miles near the entrance to Big Bras d'Or Lake. Several miles of submarine areas are also included. The Harmsworths are taking up the matter with a view to securing cheap fuel for their Newfoundland pulp enterprise.

Stellarton.—The Intercolonial Coal Company has discovered by boring a new seam of coal within the town limits of Stellarton.

Westville.—A fatal accident occurred at the Drummond Colliery on June 17th. A fall of rock instantly killed Duncan Mac-Master.

Port Hood.—As a result of test boring near the Seaside Wharf the Port Hood-Richmond Railway Coal Company has struck the overlying 8 foot seam. This was cut at a shallow depth. The seam was exposed many years ago but was covered by drift. Old inhabitants remember when the outcrop was visible. Sand washed in from the bar covered it, and until now it has been but a tradition.

Truro.—Near Moose River gold mines, Halifax County, scheelite has been found in drift. Areas have been taken up and parties are prospecting for the mother lode.

#### BRITISH COLUMBIA.

Fernie.—James Ferguson was instantly killed at Michel, No. 5 mine, of the C. N. Pass Coal Company, on Friday, July 3rd. Loaded cars broke loose and the unfortunate man was killed instantly.

Greenwood.—Mr. P. J. Roosa has been appointed manager of the Dominion Copper Company's mines and smelter in succession to Mr. W. C. Thomas, who has accepted an appointment in Utah. Mr. Roosa was for five years Mr. Thomas' chief of staff. He has the confidence of the community. Mr. John Cawile is to be general foreman of the smelter. There are no changes in the list of mine officials. The 750 ton furnace was blown in on the 28th of June. The two small furnaces will not be blown in until an up-to-date electric feed process is installed.

Vancouver.—The discovery of a belt of copper ore at Tasso Harbor, Queen Charlotte Islands, has been reported here.

Victoria.—A well authenticated report has it that negotiations are in progress for the purchase of the Wellington Collieries, controlled by Lieut.-Governor Dunsmuir. John Arbuthnot, ex-Mayor of Winnipeg, and Luke Wishart, of New York, are concerned in the transaction. The consideration is said to be upwards of \$5,000,000.

Atlin.—In spite of the desertion of this camp by the Guggenheims there is every prospect of a good clean-up for the season. On Pine Creek the North Columbia Hydraulic will operate, and on McKee Creek the McKee Creek Consolidated will be active.

## MINING NEWS OF THE WORLD.

#### GREAT BRITAIN.

The North of England Branch of the National Association of Colliery Managers have submitted to the general body a resolution favoring the establishment of a rescue station in some central position for Durham and Northumberland mines. They embodied with it an expression of opinion that the practical possibilities of the use of breathing apparatus were being exaggerated to a degree which might prove dangerous.

Many extensions and new enterprises in connection with the development of the Northumberland coal fields are reported. Shipments from this field have greatly increased and the output for the first six months of the year will probably be a new record.

#### FRANCE.

The Societe de l'Industrie Minerale, the most important mining and metallurgical association in France, celebrated its jubilee anniversary held by a congress at St. Etienne from June 14th to June 20th, which was attended by 436 engineers. Visits were paid to leading collieries and steam works. Mr. Bennett H. Brough presented a congratulatory address from the British Iron and Steel Institute.

Nine miners were suffocated in the Montmartre No. 2 pit of the La Loire mines near St. Etienne, on June 22nd. They were engaged in constructing barriers against a fire which had broken out in the mine and the ventilation was cut off.

#### RUSSIA.

The extensive Briansk iron and steel works in South Russia, principally owned by French capitalists, have closed down indefinitely.

By a fire, which broke out on the 3rd inst., at the Rikovsky mine, Yusovo, followed by an explosion of gas, over 200 miners



were killed. The rescue work, which resulted in saving many of those in the mine, was conducted under great difficulties, six of the rescuers being among the victims.

#### SPITZBERGEN.

The coal mines worked by the Trondhjem American Spitzbergen Coal Company have been extended and deepened and regular workings will be begun in August. The Anglo-Bergen Company mined 4,000 tons during the winter and will supply the Norwegian State railways and sell to steamship companies in Norway.

#### AUSTRALASIA.

Mr. Menzies, the discoverer of the Menzies gold field in Western Australia, prospecting in the northern territory of the Commonwealth, has discovered tin deposits of value on the Fitzmaurice fall of the table-lands country. Specimens show over 70 per cent. of tin.

A new copper field is being opened up at Mount Balfour, on the northwest coast of Tasmania, where work has been undertaken at several points.

Mr. H. Y. S. Brown, Government Geologist of South Australia, states that 21,000,000 tons of iron ore averaging 66 per cent. iron and manganiferous iron are in sight at Tron Knob, 40 miles from Port Augusta.

The mines at Broken Hill, New South Wales, are rigidly economizing in view of the decrease in metal values. Staffs are being reduced and development restricted.

#### UNITED STATES.

At the San Antonio mine in the Red Mountain district, Colorado, a body of copper ore 30 feet long by 25 feet wide has been found, giving every indication of being persistent in depth.

A large number of zinc mines in the Joplin, Missouri, district, have been closed down owing to the expense of keeping them free from water and the present low price of zinc. Some of the mines are installing better pumping machinery.

Copper production in the Butte district of Montana will show a considerable falling off on account of floods. About 7,000 men are employed in the Amalgamated mines, the output of which is about 8,500 tons of ore per day. The Great Falls smelter of the Boston & Montana Company, which was greatly damaged by flooding, is likely to be out of commission for some time.

The School of Mines building of the University of Nevada at Reno, the gift of Clarence H. Mackay and Mrs. John Mackay, which cost \$750,000, was dedicated last month. Mr. Mackay also promises an endowment fund for salaries.

#### CHINA.

A mining company has been formed with \$2,000,000 capital to work the iron, coal and galena mines near Okran, the principal stockholders being Chinese in Hong Kong and Singapore. The project includes the erection of smelters and a narrow gauge railway to tide water.

#### PHILIPPINE ISLANDS.

Gold dredging appears likely to become a profitable undertaking, as there are large tracts of alluvial gold-bearing land, which preliminary tests indicate to be worth working. About 80 ounces gold valued at £300 were recently sent down from the Paracale district.

#### MEXICO.

An explosion in a mine belonging to the Mexican Coal & Coke Company killed twenty Mexican and Japanese miners.

The enactment of the proposed new mining law excluding foreigners from acquiring mining properties has apparently been indefinitely postponed.

## STATISTICS AND RETURNS.

The output of the Dominion Coal Company's collieries for June is estimated at 347,000 tons. This would bring the total output for the half year up to 1,924,619 tons, or an increase over the corresponding period a year ago of 170,899 tons, which, on the whole, is a very satisfactory showing.

Mr. James Ross in London stated the year's output will be close to 4,000,000 tons and at the present rate that figure will be reached.

The output by months is as follows:

	1908.	1907.
	Tons.	Tons.
January .....	314,108	252,248
February ... ..	285,649	225,988
March .....	346,529	212,831
April .....	298,745	316,384
May .....	332,588	327,269
June .....	347,000	319,000
Total ... ..	1,924,619	1,653,720

The output of the Crow's Nest Pass collieries for the week ending July 3 was 17,957 tons, a daily average (five days) of

3,591 tons. All collieries were idle on Dominion Day. Week ending July 5, 1907, 17,748 tons; daily average, 3,549 tons; week ending July, 1906, 11,692 tons; daily average, 2,923 tons.

The corrected returns, by collieries, of the Dominion Coal Company's outputs are as follows:

#### OUTPUTS—JUNE, 1908.

No. 1 colliery .....	52,316
No. 2 colliery .....	66,851
No. 3 colliery .....	36,052
No. 4 colliery .....	38,836
No. 5 colliery .....	39,758
No. 6 colliery .....	23,178
No. 7 colliery .....	13,665
No. 8 colliery .....	21,384
No. 9 colliery .....	35,339
No. 10 colliery .....	15,527

342,906



Shipments from the collieries of the Cumberland Railway & Coal Company, Springhill, N.S., for the month of June were 29,041 tons.

**COBALT ORE SHIPMENTS.**

Shipments of ore from the Cobalt camp for the week ending June 27th totalled 820,270 pounds, or 405 tons, divided among eleven mines.

	Week ending June 27.	Since Jan. 1.
Buffalo	42,680	696,390
Coniagas	63,210	631,890
City of Cobalt	116,400	568,510
McKinley	58,120	1,615,280
Nipissing	62,400	2,045,400
O'Brien	63,320	3,008,740
Right of Way	60,480	363,770
Temiskaming	120,000	445,000
Tretheway	133,500	1,264,226
Watts	60,160	306,180

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

	Week ending July 4.	Since Jan. 1.
Buffalo	.....	696,390
Coniagas	.....	631,890
Cobalt Lake	.....	246,455
Crown Reserve	.....	84,000
Cobalt Central	.....	156,380
City of Cobalt	46,870	615,380
Drummond	.....	188,600
Foster	.....	238,400
Kerr Lake	.....	462,300
King Edward	.....	127,240
La Rose	62,240	2,508,562
McKinley	120,000	1,735,280
Nipissing	111,340	2,156,740
Nova Scotia	.....	271,545
Little Nipissing	.....	40,110
Nancy Helen	.....	140,420
O'Brien	212,730	3,221,470
Right of Way	.....	363,770
Provincial	.....	143,210
Silver Queen	.....	634,510
Silver Cliff	.....	52,000
Silver Leaf	.....	196,620
Townsite	54,600	130,700
Temiskaming	100,000	545,000
Temiskaming & H. B.	60,000	724,000
Tretheway	108,180	1,372,406
Watts	.....	306,180

The total shipments for the week were 866,960 pounds, or 433 tons. Total shipments from January 1st are 18,220,348 pounds, or 9110 tons.

Of the shipments for the week ending July 4th 147,850 pounds went from the Obrien mine to the Deloro smelter. The same mine shipped 64,880 pounds to Denver.

La Rose shipped 62,240 pounds to the Anglo-French Nickel Company, Swansea. The Copper Cliff smelter received 45,600 pounds from the Cobalt Townsite and 46,870 pounds from the City of Cobalt mine.

**BRITISH COLUMBIA ORE SHIPMENTS.**

The shipments from the mines and the receipts at the smelters of the districts of Southeastern British Columbia for the week ending June 27 and year to date were as follows:

Ore Shipments:	Week.	Year.
Boundary	32,423	570,051
Rossland	5,396	137,200
East of Columbia River	1,330	47,713

The total ore shipments for the past week were 39,149 tons, and for the year to date 754,964 tons.

Smelter Receipts:	Week.	Year.
Grand Forks	22,011	522,823
Greenwood	11,089	48,005
Trail	5,241	133,502
Northport (Le Roi)	1,450	41,358
Marysville	.....	5,730

For the week ending July 4th:—

Boundary:	Week.	Year.
Granby	20,522	543,345
Mother Lode	5,940	40,170
Oro Deloro	1,190	13,666
Rawhide	1,500	1,506
Sunset	450	450
Brooklyn	104	104
Mt. Rose	45	45
Other mines	...	522
<b>Total</b>	<b>29,751</b>	<b>599,802</b>

Rossland:	Week.	Year.
Centre Star	1,815	85,469
Le Roi	1,540	39,978
Le Roi No 2	645	15,099
Other mines	...	552
<b>Total</b>	<b>4,000</b>	<b>141,098</b>

Slocan-Kootenay:	Week.	Year.
St. Eugene	600	10,375
Whitewater	143	512
Whitewater, milled	280	7,420
Poorman, milled	185	5,850
Queen, milled	185	4,800
North Star	34	1,428
Richmond	72	957
Arlington, Erie	70	810
Rambler Cariboo	20	688
Sunset	42	166
Westmount	44	91
No. 1	14	14
M. & H.	10	10
Other mines	...	16,389
<b>Total</b>	<b>1,764</b>	<b>49,477</b>

The total shipments for the past week were 35,518 tons and for the year to date 790,377 tons.



**SMELTER RECEIPTS.**

	Week.	Year.
Granby . . . . .	20,522	543,345
B. C. Copper Co. . . . .	7,751	55,756
Dominion Copper Co. . . . .	2,099	2,099
Trail . . . . .	5,603	139,105
Le Roi, Northport Wash . . .	1,690	43,070

The total smelter receipts for the past week were 37,665 tons and for the year to date 789,105 tons.

According to the estimates of Kaffir houses in London, the June output of Transvaal gold falls below May, which was the high record, but was above every other month except March. The output was 570,000 ounces fine. In May it was 581,992 fine ounces. The value of the June output, calculated on the basis of the above estimate, compares as follows:—June, 1908, \$12,112,000; May, 1908, \$12,360,000; April, 1908, \$11,924,000; March, 1908, \$12,210,000; February, 1908, \$11,510,000; January, 1908, \$11,900,000; June, 1907, \$10,780,000; June, 1906, \$10,109,000; June, 1905, \$8,757,000; June, 1904, \$6,546,000; June, 1903, \$5,062,000; June, 1902, \$3,032,000.

The imports of zinc ores into the United States for the first five months of 1908 amounted to 10,900 tons, of which 5,796 tons were classified as dutiable.

**COMPANY NOTES.**

A half-yearly dividend of three and one-half per cent (3½ per cent.) has been declared on the preferred stock of Dominion Coal Company, Limited, payable on August 1st, 1908, to shareholders of record at the closing of the books on July 31st, 1908.

Transfer books of the preferred stock will be closed from July 21st, at 3 p.m., until August 1st, at 10 a.m.

Sir George Drummond and Mr. E. S. Clouston have resigned from the Cumberland Railway & Coal Company, and two new directors were elected at the annual meeting.

The new directors are Mr. Percy Cowans, of McDougall & Cowans, members of the Montreal Stock Exchange, and Mr. J. D. Hayden, of Cobourg.

Sir George Drummond was president of the company, and is succeeded by his son, Mr. Huntley Drummond.

Mr. Edgar Macdougall was elected vice-president, and Messrs. David Maurice, W. J. Maurice, J. R. Cowans, G. L. Cains, W. G. Crossen, P. P. Cowans and J. D. Hayden, directors.

Mr. J. R. Cowans was elected general manager, and E. Laflamme secretary-treasurer.

This company has its properties at Springhill, N.S., and in Cape Breton, the coal areas in the latter place being leased recently on a royalty basis to the Dominion Steel Company.

A report submitted by an outside expert shows the properties to be in splendid shape.

Bell's Asbestos Company, Limited, have declared an interim dividend of 1s per share free of income tax for the half year ending 30th June, being at the rate of ten per cent. per annum,

payable by warrant on and after the 1st August to the shareholders on the register on the 23rd proximo.

The share transfer books will be closed from the 23rd July to the 30th July, both days inclusive.

**MARKETS REPORTS.****Coke.**

July 7th—Connellsville coke, f.o.b. ovens—  
Furnace coke, prompt, \$1.55 to \$1.60.  
Furnace coke, prompt, \$1.90 to \$2.

**Pig Iron.**

July 7th—Pittsburg—  
No. 2 foundry, \$15.50 to \$15.90.  
Bessemer, \$16.90 to \$17.15.  
Basic, \$16.15 to \$16.40.  
Malleable, \$15.90 to \$16.40.  
Southern No. 2, \$16.40 to \$16.90.

**Other Metals.**

July 7th—  
Tin, Straits, 27.65 cents.  
Copper, prime Lake, 12.80 to 12.90 cents.  
Lake, arsenical brands, 12.75 cents.  
Electrolytic copper, 12.70 to 12.80 cents.  
Sheet copper, 17 cents.  
Copper wire, 14.75 cents.  
Lead, 4.50 cents.  
Spelter, 4.475 cents.  
Sheet zinc, 7.50 cents.  
Antimony, Cookson's, 8.50 to 8.60 cents.  
Aluminium, 32 cents.  
Nickel, 45 to 47 cents.  
Platinum, \$25.50 per ounce.  
Bismuth, \$1.75 per pound.  
Quicksilver, \$43 per 75 pound flask.

**Silver Prices.**

	New York Cents.	London. Pence.
June 24 . . . . .	54⅞	25 3-16
June 25 . . . . .	54¾	25¼
June 26 . . . . .	54¼	25
June 27 . . . . .	53¾	24¾
June 29 . . . . .	54	24⅞
June 30 . . . . .	53⅝	34¾
July 1 . . . . .	53½	25 11-16
July 2 . . . . .	53¾	24 13-16
July 3 . . . . .	53¾	24 13-16
July 4 . . . . .	..	24 13-16
July 6 . . . . .	54	24⅞
July 7 . . . . .	53¾	24 13-16

**MARKET NOTES.**

The average prices of copper for the past 14 months stood as follows:—1907—May, 25.21; June, 24.375; July, 23.35; August, 20.92; September, 16.75; October, 14.12; November, 14.105; December, 13.65. 1908—January, 13.935; February, 13.33; March, 12.08; April, 12.90; May, 12.90; June, 12.95.

The highest figure recorded during that period was 26.125 on May 29th, 1907. The lowest was 12.68, reached on several occasions throughout February and March, 1908.